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The present volume is the ninety-second of this series.

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ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

CONTENTS

	Pages
BLACKMAN, M. W. New species of bark beetles (Pityophthorini) from Mexico and tropical America (Coleoptera, Scolytidae). No. 3147. November 25, 1942 ¹ -----	177-228
New genus: <i>Pityophthoroides</i> .	
New species: <i>Thammophthorus schwarzi</i> , <i>Neodryocoetes mucunae</i> , <i>N. hubbardi</i> , <i>N. tabogae</i> , <i>N. curibaeus</i> , <i>N. guianae</i> , <i>N. hoodi</i> , <i>N. humilis</i> , <i>N. hostilis</i> , <i>N. teres</i> , <i>N. cubensis</i> , <i>N. buscki</i> , <i>N. pallidus</i> , <i>N. schedli</i> , <i>N. exquisitus</i> , <i>N. tenuis</i> , <i>N. lenis</i> , <i>Pityophthoroides pudens</i> , <i>P. robat</i> , <i>Myeloborus deleoni</i> , <i>Pityoborus tertius</i> , <i>Spermophthorus caesalpiniae</i> , <i>Pityophthorus leiophyllae</i> , <i>P. regularis</i> , <i>P. sambuci</i> , <i>P. pudicus</i> , <i>P. subopacus</i> , <i>P. ciliatus</i> , <i>P. rudis</i> , <i>P. auctor</i> , <i>P. hidalgoensis</i> , <i>P. cribratus</i> , <i>P. cuspidatus</i> , <i>P. perotei</i> , <i>P. spadix</i> , <i>P. coronarius</i> , <i>P. dimidiatus</i> , <i>P. attenuatus</i> , <i>P. costalimai</i> , <i>P. shannoni</i> , <i>P. zeteki</i> , <i>Gnathotrichus deleoni</i> .	
-----. Revision of the genus <i>Phloeosinus</i> Chapuis in North America (Coleoptera, Scolytidae). No. 3154. December 21, 1942 ¹ -----	397-474
New species: <i>Phloeosinus alaskanus</i> , <i>P. hoferi</i> , <i>P. keeni</i> , <i>P. spinosus</i> , <i>P. arizonicus</i> , <i>P. splendens</i> , <i>P. buckhorni</i> , <i>P. kaniksu</i> , <i>P. rusti</i> , <i>P. chiricahua</i> , <i>P. squamosus</i> , <i>P. deleoni</i> , <i>P. neomezicanus</i> , <i>P. texanus</i> , <i>P. furnissi</i> , <i>P. chamberlini</i> .	
BLACKWELDER, RICHARD E. Notes on the classification of the staphylinid beetles of the groups Lispini and Osoriinae. No. 3140. April 7, 1942 ¹ -----	75-90
New subgenera: <i>Liberiella</i> , <i>Liberiana</i> , <i>Rumeba</i> , <i>Nacaeus</i> , <i>Spinilus</i> , <i>Neolosus</i> , <i>Retinda</i> .	
New species: <i>Pseudolispinodes</i> (<i>Liberiella</i>) <i>cooki</i> , <i>P.</i> (<i>Liberiana</i>) <i>femoralis</i> , <i>P.</i> (<i>Rumeba</i>) <i>lispinoides</i> .	
BLAKE, DORIS H. The chrysomelid beetles <i>Luperodes bivittatus</i> (LeConte) and <i>varicornis</i> (LeConte) and some allied species. No. 3139. April 7, 1942 ¹ -----	57-74
New species: <i>Luperodes diegensis</i> , <i>L. monorhabdus</i> , <i>L. tuberculatus</i> , <i>L. melanolomatus</i> , <i>L. nebrodes</i> , <i>L. flavoniger</i> , <i>L. rugipennis</i> , <i>L. pallidulus</i> , <i>L. elachistus</i> , <i>L. popenoei</i> , <i>L. chiricahuensis</i> , <i>L. convexus</i> , <i>L. ocularis</i> , <i>L. punctatissimus</i> , <i>L. vandykei</i> .	

¹ Date of publication.

- BÖVING, ADAM G. Descriptions of the larvae of some West Indian melolonthine beetles and a key to the known larvae of the tribe. No. 3146. June 13, 1942¹----- 167-176
- CHANDLER, ASA C. Some cestodes from Florida sharks. No. 3135. February 9, 1942¹----- 25-31
 New genus: *Diploötobothrium*.
 New species: *Thysanoccephalum rugosum*, *Diploötobothrium springeri*, *Dasyrhynchus insigne*.
- CLARKE, J. F. GATES. Notes and new species of Microlepidoptera from Washington State. No. 3149. October 13, 1942¹----- 267-276
 New genus: *Arla*.
 New species: *Unorimoschema arnicella*, *Arla tenuicornis*, *Chionodes loetae*, *C. whitmanella*, *Filatima roceliella*, *F. albicostella*, *F. cushmani*, *Aroga websteri*, *Zelleria pyri*.
 New combination: *Lita princeps* (Busck).
- COOKE, C. WYTHE. (See under Henderson, E. P.)
- CUSHMAN, R. A. The genotypes of some of Ashmead's genera of ichneumon-flies. No. 3150. October 8, 1942¹----- 277-289
 New combinations: *Joppidium ferrugineum* (Ashmead), *Epturus albicinctus* (Ashmead), *Camptotypus abbottii* (Ashmead).
- EWING, H. E., and FOX, IRVING. New neotropical insects of the apterygotan family Japygidae. No. 3151. October 1, 1942¹----- 291-299
 New species: *Evalljapyx duricauda*, *E. manni*, *Catajapyx neotropicalis*, *Metajapyx schwarzi*, *Mixojapyx cooki*, *M. barberi*, *Neojapyx tropicalis*.
- FOX, IRVING. (See under Ewing, H. E.)
- GAHAN, A. B. Descriptions of five new species of Chalcidoidea, with notes on a few described species (Hymenoptera). No. 3137. March 4, 1942¹----- 41-51
 New species: *Brachymeria jambolana*, *B. discreta*, *B. discretoides*, *Blepyrus saccharicola*, *Ooencyrtus anabrivorus*.
 New combination: *Hypsicamara lachni* (Ashmead).
- GAZIN, C. LEWIS. The late Cenozoic vertebrate faunas from the San Pedro Valley, Ariz. No. 3155. December 10, 1942¹----- 475-518
 New genera: *Bensonomys*, *Nerterogeomys*.
 New species: *Sylvilagus ? bensonensis*, *Canis edwardii*, *Spilogale pedroensis*.
- GILMORE, CHARLES W. Osteology of *Polyglyphanodon*, an Upper Cretaceous lizard from Utah. No. 3148. October 13, 1942¹----- 229-265
 New family: Polyglyphanodontidae.

¹ Date of publication.

	Pages
GLASSELL, STEVE A. A new stomatopod crustacean from the west coast of Mexico. No. 3138. March 26, 1942 ¹ -----	53-56
New species: <i>Squilla oculinova</i> .	
HARTMAN, OLGA. The identity of some marine annelid worms in the United States National Museum. No. 3142. June 10, 1942 ¹ -----	101-140
New species: <i>Lumbrineris moorei</i> .	
HENDERSON, E. P., and COOKE, C. WYTHE. The Sardis (Georgia) meteorite. No. 3143. April 30, 1942 ¹ -----	141-150
HENDERSON, E. P., and PERRY, STUART H. The Freda, N. Dak., meteorite: A nickel-rich ataxite. No. 3134. March 23, 1942 ¹ -----	21-23
HILL, A. T. (See under Wedel, W. R.)	
KIRK, EDWIN. <i>Rhopocrinus</i> , a new fossil inadunate crinoid genus. No. 3144. April 24, 1942 ¹ -----	151-155
New family: Pachylocrinidae.	
New genus: <i>Rhopocrinus</i> .	
New species: <i>Rhopocrinus spinosus</i> .	
New combinations: <i>Rhopocrinus municipalis</i> (Troost), <i>R. proboscidiatis</i> (Worthen).	
MACKIN, J. G. A new species of phyllopod crustacean from the southwestern short-grass prairies. No. 3136. April 15, 1942 ¹ -----	33-39
New species: <i>Streptocephalus dorotheae</i> .	
MALLOCH, JOHN R. Notes on two genera of American flies of the family Trypetidae. No. 3133. January 7, 1942 ¹ -----	1-20
New species: <i>Trypanes peruviana</i> , <i>T. tezana</i> , <i>T. arizonensis</i> , <i>T. erasa</i> , <i>T. californica</i> , <i>T. microscutulosa</i> .	
PERRY, STUART H. (See under Henderson, E. P.)	
SANDHOUSE, GRACE A. The type species of the genera and subgenera of bees. No. 3156. March 5, 1943 ¹ -----	519-619
New names: <i>Abda</i> , <i>Baana</i> , <i>Corynuroides</i> , <i>Euryapis</i> , <i>Heterapoides</i> , <i>Kelita</i> , <i>Mehelyana</i> , <i>Meleu</i> .	
SAYLOR, LAWRENCE W. Notes on beetles related to <i>Phyllophaga</i> Harris, with descriptions of new genera and subgenera. No. 3145. June 11, 1942 ¹ -----	157-165
New genera: <i>Triodonys</i> , <i>Onemarachis</i> , <i>Olemora</i> .	
New subgenera: <i>Cnemarachis</i> , <i>Aborana</i> .	

¹ Date of publication.

- SCHULTZ, LEONARD P. The fresh-water fishes of Liberia. No. 3152. November 13, 1942¹----- 301-348
- New genus: *Mannichthys*.
 New species: *Nannocharax seiboldi*, *Barilius silex*, *Mannichthys lucileae*, *Barbus flomoi*, *B. boboi*, *Paramphilius freestonei*.
 New subspecies: *Micropanchax macrurus manni*.
- SMITH, HOBART M. Mexican herpetological miscellany. No. 3153. November 5, 1942¹----- 349-395
- New species: *Sceloporus stejnegeri*, *S. prezygus*, *Celestus rozellae*, *Gaigeta dontomasi*, *G. radula*, *Clelia baileyi*.
 New subspecies: *Sceloporus formosus scitulus*, *S. mucronatus aureolus*, *S. jarrovi sugillatus*, *S. melanorhinus calligaster*, *Phrynosoma douglassii brachycercum*, *Gerrhonotus levicollis ciliaris*, *Lepodiphyma smithii tehuanae*, *L. smithii occulor*, *Drymobius margaritiferus*, *flstulosus*, *Imantodes splendidus oliverti*, *Clelia clelia immaculata*.
- WEDEL, W. R., and HILL, A. T. Scored bone artifacts of the central Great Plains. No. 3141. April 28, 1942¹----- 91-100

¹ Date of publication.

ILLUSTRATIONS

PLATES

	Following page
1. Freda, N. Dak., meteorite.....	22
2. Freda meteorite: Groundmass and invasion of fusion.....	22
3. Freda meteorite: Kamacite and invasion of oxide.....	22
4. Freda meteorite: Kamacite and eutectic inclusions.....	22
5-6. Beetles of genus <i>Luperodes</i>	74
7-11. Scored bone artifacts from Nebraska, Kansas, North Dakota, and South Dakota.....	100
12. Rib implements from Kansas and Nebraska.....	100
13. Potsherds from Nebraska and North Dakota.....	100
14. Main mass of Sardis meteorite.....	144
15. Coarse octahedrite, Sardis meteorite.....	144
16. <i>Rhopocrinus spinosus</i> , new genus and species.....	155
17. Hind tibia, middle tibia, and tarsal claw of beetles related to <i>Phyllophaga</i> Harris.....	64
18. Species of <i>Melolontha</i> , <i>Anoxia</i> , <i>Polyphylla</i> , and <i>Rhizotrogus</i>	176
19. Species of <i>Cnemarachis</i> , <i>Clemora</i> , and <i>Ancylonycha</i>	176
20. Species of <i>Thamnophthorus</i> and <i>Neodryocoetes</i>	228
21. Species of <i>Neodryocoetes</i> , <i>Spermophthorus</i> , and <i>Pityophthoroides</i> ..	228
22. Species of <i>Mycloborus</i> , <i>Pityoborus</i> , and <i>Pityophthorus</i>	228
23. Species of <i>Pityophthorus</i>	228
24. Views of type locality of <i>Polyglyphanodon sternbergi</i>	232
25. Skeletons of <i>Polyglyphanodon sternbergi</i>	265
26. Restoration of skeleton of <i>Polyglyphanodon sternbergi</i>	265
27. <i>Filatima albicostella</i> , new species	276
28. <i>Filatima rocelicella</i> , new species, <i>F. cushmani</i> , new species, and <i>Zelleria pyri</i> , new species.....	276
29. <i>Aroga websteri</i> , new species, and <i>Gnorimoschema arnicella</i> , new species.....	276
30. <i>Chionodes whitmanella</i> , new species, <i>Chionodes loctae</i> , new species, and <i>Arla tenuicornis</i> , new species.....	276
31. <i>Arla tenuicornis</i> , new species, <i>Zelleria pyri</i> , new species, and <i>Chionodes loctae</i> , new species.....	276
32. <i>Arla tenuicornis</i> , new species, <i>Gnorimoschema arnicella</i> , new species, and <i>Aroga websteri</i> , new species.....	276
33. Abdominal segments of <i>Evalljapyx duricauda</i> , <i>Catajapyx neotropicalis</i> , and <i>Evalljapyx manni</i> , new species.....	290
34. <i>Metajapyx schwarzi</i> , new species, <i>Mixojapyx cooki</i> , new species, <i>M. barberi</i> , new species, and <i>Neojapyx tropicalis</i> , new species.....	290
35. <i>Nannocharax seiboldi</i> , new species, <i>Barilius silex</i> , new species, and <i>Mannichthys lucilcae</i> , new genus and species.....	348
36. <i>Barbus flomoi</i> , new species, <i>B. boboi</i> , new species, <i>Paramphilius firestonei</i> , new species, and <i>Micropanchax macrurus manni</i> , new subspecies.....	348
37. <i>Imantodes cenchoa leucomelas</i> Cope, and <i>I. latistratus</i> Cope.....	384
38-40. Elytral declivity in <i>Phloeosinus</i>	474
41. Elytral declivity and face views of <i>Phloeosinus</i>	474
42. Portion of Benson Quadrangle, Arizona.....	478
43. View overlooking Curtis ranch, and view across San Pedro Valley from Curtis ranch.....	478

TEXT FIGURES

	Page
1. Wings of species of <i>Trypanea</i>	7
2. New cestodes from Florida sharks.....	26
3. <i>Dasyrhynchus insignis</i> (Linton).....	29
4. <i>Streptocephalus texanus</i> and <i>S. dorotheae</i> , second antennae.....	35
5. <i>Streptocephalus texanus</i> and <i>S. dorotheae</i> , caudal furcae.....	35
6. Map showing distribution of <i>Streptocephalus texanus</i> and <i>S. dorotheae</i>	36
7. <i>Squilla oculinova</i> , new species, female holotype.....	55
8. Species of <i>Leanira</i> , <i>Anattides</i> , <i>Eumida</i> , and <i>Psammolyce</i>	105
9. Species of <i>Eulalia</i> , <i>Phyllodoce</i> , <i>Glycera</i> , <i>Etcone</i> , and <i>Nephtys</i>	111
10. Species of <i>Lumbrineris</i>	115
11. Species of <i>Petaloproctus</i> , <i>Drilonereis</i> , and <i>Lumbrineris</i>	119
12. Species of <i>Lumbrineris</i> and <i>Armandia</i>	121
13. Species of <i>Lumbrineris</i> and <i>Arabella</i>	123
14. Species of <i>Armandia</i> , <i>Ammotrypane</i> , and <i>Lumbrineris</i>	130
15. Species of <i>Potamethus</i> and <i>Chone</i>	135
16. Skull of <i>Polyglyphanodon sternbergi</i> Gilmore, type, from right side.....	234
17. Skull of <i>Polyglyphanodon sternbergi</i> Gilmore, type, from top.....	235
18. Skull of <i>Polyglyphanodon sternbergi</i> Gilmore, type, posterior view.....	237
19. Palate of <i>Polyglyphanodon sternbergi</i> Gilmore, type.....	239
20. Left ramus of <i>Polyglyphanodon sternbergi</i> Gilmore, type.....	241
21. Right ramus of <i>Polyglyphanodon sternbergi</i> Gilmore.....	242
22. Lower teeth of <i>Polyglyphanodon sternbergi</i> Gilmore.....	243
23. Cervical vertebrae of <i>Polyglyphanodon sternbergi</i> Gilmore, type.....	245
24. Median dorsal vertebra of <i>Polyglyphanodon sternbergi</i> Gilmore.....	247
25. Posterior dorsal vertebra of <i>Polyglyphanodon sternbergi</i> Gilmore.....	248
26. Dorsal, sacral, and caudal vertebrae of <i>Polyglyphanodon sternbergi</i> Gilmore.....	249
27. Right scapula-coracoid of <i>Polyglyphanodon sternbergi</i> Gilmore.....	252
28. Left clavicle of <i>Polyglyphanodon sternbergi</i> Gilmore.....	253
29. Interclavicles of <i>Polyglyphanodon sternbergi</i> Gilmore.....	253
30. Left humerus of <i>Polyglyphanodon sternbergi</i> Gilmore.....	254
31. Left radius and ulna of <i>Polyglyphanodon sternbergi</i> Gilmore.....	255
32. Right fore foot of <i>Polyglyphanodon sternbergi</i> Gilmore.....	257
33. Right half of pelvis of <i>Polyglyphanodon sternbergi</i> Gilmore.....	258
34. Left femur of <i>Polyglyphanodon sternbergi</i> Gilmore.....	259
35. Right tibia and fibula of <i>Polyglyphanodon sternbergi</i> Gilmore, type.....	260
36. Left hind foot and part of tarsus of <i>Polyglyphanodon sternbergi</i> Gilmore.....	262
37. Map of Liberia showing river systems.....	304
38. Diagram showing range of variation in femoral pore counts of <i>Sceloporus melanorhinus</i>	361
39. Left lower cheek teeth of <i>Sylvilagus ? bensonensis</i> , new species.....	492
40. Right upper cheek tooth of <i>Nannippus cf. phlegon</i> (Hay).....	494
41. <i>Canis edwardii</i> , new species: Skull and right ramus of mandible of type.....	500
42. <i>Spilogale pedroensis</i> , new species: Left maxillary portion.....	502
43. <i>Spilogale pedroensis</i> , new species: Right ramus of mandible.....	502
44. Left humerus of <i>Felis</i> sp., near <i>F. lacustris</i> Gazin.....	504
45. Fourth lower premolar of <i>Felis</i> sp., near <i>F. atrox</i> Leidy.....	505
46. Right ramus of mandible of <i>Tanupolama cf. longurio</i> (Hay).....	515
47. Right maxillary portion of <i>cf. Capromeryx gidleyi</i> Frick.....	517



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NOTES ON TWO GENERA OF AMERICAN FLIES OF THE
FAMILY TRYPETIDAE

By JOHN R. MALLOCH

THIS paper presents notes on the species of the genera *Trypanea* and *Neaspilota*, including those described by Coquillett and Benjamin, the types of these being in the collection of the United States National Museum in Washington.

Genus TRYPANEA Schrank

1795. *Trypanea* SCHRANK, Naturhistorische und ökonomische Briefe über das Donaumoos, p. 147.

It is known that there are a number of exotic species of *Trypanea* that show rather marked sexual dimorphism, but there are no records of such cases in America. In several species there are just as marked distinctions between the sexes as are met with in other regions and these are dealt with below. Unfortunately there are comparatively few records of food habits of the larvae, but what I have been able to gather from all sources are included herein.

The genus as accepted by me contains species with the following characters:

Characters of the genus.—Head not exceptionally elongated, usually a little longer than high, with the frons flattened and longer than its width at vertex, narrowed slightly in front, the inner pair of vertical bristles the longest on the head, the outer pair very much shorter; supraorbitals two in number, the upper one short and yellow; infraorbitals usually three pairs, the anterior pair usually much the shortest and sometimes not developed, usually dark colored, and

incurved. The frontal bristles usually much shorter and weaker in the male than in the female. Antennae short, the third segment not twice as long as its width at base, with the lower apical angle rounded, the upper one rather acute, the arista subnude; proboscis short and stout; palpi normal. Thorax with the usual two pairs of dorsocentral bristles, the anterior pair near the suture; the prescutellar acrostichals undeveloped; scutellum usually with but the basal pair of bristles present, the disk centrally bare, the sides short haired. Wing always with a large preapical black mark that emits a number of rays of variable width and extent, the third vein sometimes with some microscopic hairs above basally and more extensively below. Legs normal, mid femur sometimes with bristles on the ventral or anterior surface in at least the males of some species, the hind tibia with usually some microscopic anterodorsal setulae.

Several species of very similar appearance to the typical forms have been removed from the genus by different writers because they have a pair of short apical bristles on the scutellum and but two pairs of incurved infraorbital bristles on the frons. I disregard these two characters as generic criteria as the apical scutellars are sometimes very small, and in some typical species of *Trypanea* the anterior pair of infraorbitals is very minute or even lacking in particular specimens. I believe by following this rule we may arrive at a better understanding of the genus.

In almost all the species with the characteristic starlike preapical black mark on the wing there is a small, round, hyaline mark or spot immediately below the extreme tip of the second vein, whereas in the other group of species in which there are numerous brown marks on the basal half of the wing there is no small spot at this point, but instead there is one above the tip of the second vein. If the position of this spot and the type of the other wing markings are accepted as generic criteria, rather than the bristling of the frons and the scutellum, then it appears to me that we have a more natural arrangement of the species involved. This course is therefore adopted herein.

KEY TO THE SPECIES OF TRYPANEAE

- | | |
|---|--------------------------------|
| 1. Males | 2 |
| Females | 20 |
| 2. Scutellum with four bristles, the apical pair much shorter than the basal. | 3 |
| Scutellum with but one pair of bristles, the apical pair undeveloped.... | 4 |
| 3. Two of the dark rays across the apical half of the discal cell of the wing extending over the fifth vein, the outer one attaining the wing margin, and a small hyaline spot at apex of the second vein (fig. 1, a) | <i>eugenia</i> (van der Wulp) |
| One dark ray across the apical half of the discal cell, which extends over the fifth vein to the wing margin, and a large wedge-shaped hyaline mark beyond the apex of the second vein (fig. 1, b). | |
| | <i>stigmatica</i> (Coquillett) |

4. Fore tarsus short and stout, the basal segment not over twice as long as thick, with some erect, outstanding, stiff hairs on the ventral surface, sometimes projecting forward below the surface of the second segment, and the intermediate segments between it and the fifth usually with outstanding hairs on their anterior edges that are a little longer than the segments; fore tibia rather thicker than usual and with a series of minute erect stiff hairs on the dorsal surface--- 5
- Fore tarsus not abnormal in form or armature, the basal segment at least three times as long as thick, the other segments without outstanding anterior hairs and the fore tibia not thickened and with much less obvious dorsal hairing----- 7
5. A complete oblique rather slender dark brown ray from the costal margin of the stigma to the inner cross vein, and two partial dark rays across the apical third of the discal cell of the wing.
- ageratae Benjamin
- No complete dark ray from stigma to inner cross vein, and only one dark ray across the apical third of the discal cell----- 6
6. Stigma yellow (fig. 1, d)----- peruviana, new species
- Stigma with a dark mark across its middle that extends into the marginal cell (fig. 1, e)----- eclipta Benjamin
7. Third antennal segment black, basal two segments yellow; wing with a large subquadrate black mark filling the entire stigma and extending back to third vein on the field of the wing that emits a narrow line on that vein to connect with the narrow black border of the inner cross vein, and no complete Y-shaped black mark at apex emanating from the large preapical black mark to cover apices of the third and fourth veins (fig. 1, f); mid femur with one or two rather strong anteroventral bristles beyond middle----- nigricornis (Coquillett)
- Antennae entirely yellow; wing markings not as above----- 8
8. Apex of wing whitish hyaline, without a Y-shaped black mark emanating from the large preapical black mark to cover the apices of the third and fourth veins----- 9
- Apex of wing with a black Y-shaped mark emanating from the large black preapical mark, the arms of which end on the apices of the third and fourth veins----- 12
9. Mid femur without outstanding anterior bristles; a slender brown streak or ray extending from the costal margin of the stigma to the inner cross vein (fig. 1, g)----- imperfecta (Coquillett)
- Mid femur with some very short bristles on the central portion of the anterior and a number of much longer bristles on the apical half of the anteroventral surface----- 10
10. A broad black band extending obliquely from costal margin of the stigma to the inner cross vein, and a narrow black border on fifth vein from the anterior of the two dark rays across the apical half of the discal cell to base of that cell (fig. 1, i)----- femoralis (Thomson)
- At most a narrow oblique dark ray from the stigma to the inner cross vein and no dark border on fifth vein basally----- 11
11. Stigma yellowish, the costal vein black on basal half or more of the stigma (fig. 1, j)----- radifera (Coquillett)
- Stigma hyaline, with a rather broad oblique black streak across it from anterior costal angle to near apical posterior angle (fig. 1, k). microstigma Curran

12. Apices of submarginal and first posterior cells entirely brownish black, the stigma and basal portion of the wing except extreme base yellowish (fig. 1, *n*)----- *conjuncta* (Adams)
Submarginal cell usually with a small hyaline dot or spot below the apex of the second vein, and the first posterior cell always with a large lunate apical hyaline mark that extends almost entirely across its tip----- 13
13. A broad black band covering almost the entire stigma that is centrally broader than the first costal hyaline mark beyond it, and extending obliquely inward to cover the inner cross vein (fig. 1, *o*), frequently no small hyaline spot below the apex of the second vein; mid femur with bristles on the anteroventral surface apically-- *bisetosa* (Coquillett)
At most a narrow dark streak or ray extending from the stigma to the inner cross vein----- 14
14. Dark ray through the discal cell immediately proximad of the outer cross vein continued over the fifth vein to the wing margin (fig. 1, *t*).
dacetroptera Phillips
No dark ray through the apical section of the discal cell extending over the outer cross vein----- 15
15. The slender dark streak or ray from the stigma to the inner cross vein entire or almost so, at most slightly paler within the inner edge of the stigma, fifth vein usually with a small dark spot near middle of the discal cell that is sometimes visible only when the wing is viewed from the tip against the light as a darker part of the vein itself (fig. 1, *x*); frontal bristles short, the ocellars not attaining the bases of the upper infraorbitals; mid femur with distinct anterior bristles on apical half----- *actinobola* (Loew)
Slender dark streak or ray from stigma to inner cross vein more or less widely interrupted, or the other characters not as above----- 16
16. Mid femur without anterior or anteroventral outstanding bristles----- 17
Mid femur with one to several rather strong bristles on the apical half of the anteroventral surface----- 18
17. Two dark rays or fasciae through the apical half of the discal cell of the wing that extend to or beyond the middle of the cell (fig. 1, *r*), usually a dark spot on the fifth vein below the anterior ray; ocellar pair of bristles short, not attaining to the bases of the upper infraorbitals----- *texana*, new species
Only one dark ray or fascia through the apical third of the discal cell that extends to or almost to the fifth vein, and sometimes a much shorter stump of one in front of it (fig. 1, *s*), no dark spot on fifth vein near middle of the discal cell; ocellar bristles long, attaining to bases of upper infraorbital pair----- *mevarna* (Walker)
18. Mid femur with several rather long, strong, yellowish bristles on the apical half of the anteroventral surface; ocellar bristles short, not attaining to bases of the upper pair of infraorbitals-- *actinobola* (Loew)
Mid femur with but one or two dark brown bristles on the apical half of the anteroventral surface; ocellar bristles longer and stronger, attaining to or almost to the bases of the upper pair of infraorbitals-- 19
19. The dark ray almost invisible through the stigma; third wing vein with some widely separated short stiff hairs on its underside from base to beyond the inner cross vein----- *microsetulosa*, new species
The dark ray faint but evident through the stigma; third wing vein with at most one or two short hairs at extreme base below.
californica, new species

20. Scutellum with four bristles, the apical pair much shorter than the basal. 21
 Scutellum with but one pair of strong bristles, the short apical pair
 lacking ----- 22
21. Two of the dark rays across the apical half of the discal cell of the
 wing extending over the fifth vein, the outer one reaching the wing
 margin (fig. 1, *a*) ----- *eugenia* (van der Wulp)
 One dark ray across the apical third of the discal cell of the wing ex-
 tending to the wing margin (fig. 1, *b*) ----- *stigmatica* (Coquillett)
22. The preapical starlike mark on the wing extremely pale and faint,
 yellowish, centrally, only the tips of the rays in the wing margin
 readily visible (fig. 1, *w*) ----- *erasa*, new species
 The preapical starlike mark on the wing black or blackish brown and
 conspicuous ----- 23
23. A broad black band extending from the costal margin of the stigma,
 almost or entirely filling the stigma, obliquely downward and back-
 ward to connect with the large preapical black mark and enclosing
 the inner cross vein ----- 24
- At most a slender diagonal black or dark brown ray extending from the
 costal margin of the stigma, not filling the latter, to the large pre-
 apical black mark, and connecting with it at the inner cross vein,
 sometimes no diagonal ray present ----- 25
24. Third antennal segment not darker than the basal two.
bisetosa (Coquillett)
 Third antennal segment distinctly darker than the basal two.
nigricornis (Coquillett)
25. Two dark rays or fasciae through the apical half of the discal cell of
 the wing in front of the one enclosing the outer cross vein extending
 well over the fifth vein, the outer one to the wing margin (fig. 1, *v*).
arizonensis, new species
 At most only one dark fascia in the apical half of the discal cell of
 wing extending over the fifth vein ----- 26
26. The dark fascia or ray through the discal cell nearest to the outer
 cross vein extending over the fifth vein to the wing margin (fig. 1, *t*).
dacetroptera Phillips
 No dark ray through the discal cell extending to the margin of the wing. 27
27. A complete narrow black diagonal ray extending from the costal margin
 of the stigma to the inner cross vein ----- 28
 A partial or broken dark ray extending over part of the course between
 the stigma and the inner cross vein, or no ray present, when almost
 entire it may be broken only in the stigma or in the cell below it. 35
28. Two dark subequal rays in the apical half of the discal cell of the
 wing, the inner one sometimes broken and represented by a dark
 spot on the fifth vein (fig. 1, *r*) ----- *texana*, new species
 One dark ray through the apical third of the discal cell, sometimes
 a short stump of an anterior one against the fourth vein close to
 the inner cross vein, the dark dot when present close to middle of
 the discal cell, or the fifth vein with an elongate dark border on
 central third or more ----- 29
29. The hyaline mark near the base of the first posterior cell of the wing
 and directly above the outer cross vein subquadrate, extending en-
 tirely across the cell (fig. 1, *h*) ----- *imperfecta* (Coquillett)
 The hyaline mark near base of the first posterior cell of the wing
 almost directly above the outer cross vein not extending entirely
 across the cell and more or less definitely rounded above ----- 30

30. Hind coxae black, densely gray dusted..... species A¹
 Hind coxae yellow and not densely gray dusted..... 31
31. Apex of the anterior basal cell of the wing rather broadly dark brown;
 fifth vein with a small dark spot near middle of the discal cell
 (fig. 1, q)..... vicina (van der Wulp)
 Apex of the anterior basal cell of the wing not dark brown, sometimes
 with faint fuscous marks; if narrowly dark brown there is a long
 dark streak on the fifth vein centrally..... 32
32. An elongate black streak on fifth vein centrally..... 33
 Only a small dark spot or no dark mark at centre of section of fifth
 vein on the discal cell..... 34
33. Apex of the anterior basal cell of the wing dark brown---- wheeleri Curran
 Apex of the anterior basal cell of the wing not distinctly browned.
 jonesi Curran
34. The streak through the stigma black or dark brown---- actinobola (Loew)
 The streak through the stigma yellowish brown or lacking centrally---- 35
35. Stigma with a deep black subquadrate mark in basal costal angle, and
 the fifth vein with a blackish streak along central third or more
 (fig. 1, m)..... microstigma Curran
 Stigma with a rather indistinct brown continuation of the diagonal
 streak through it that is blackened on costal and hind margins where
 it touches the veins, or the ray is complete through the stigma and
 broken below it..... 36
36. A dark brown streak obliquely through the stigma extending to, or
 almost to, the hind margin of the submarginal cell, and no definite
 dark ray from that point to the inner cross vein (fig. 1, e).
 eclipta Benjamin
- At least a partial dark ray from inner cross vein to the stigma..... 37
37. No dark mark on the fifth vein near middle of the discal cell, and one
 or two fuscous marks in the apex of the anterior basal cell
 (fig. 1, s)..... mevarna (Walker)
 A dark spot on the fifth wing vein near middle of the discal cell..... 38
38. Apex of anterior basal cell dark brown (fig. 1, q)---- vicina (van der Wulp)
 Apex of anterior basal cell not dark brown..... 39
39. Apex of anterior basal cell entirely hyaline, diagonal dark ray inter-
 rupted below stigma (fig. 1, k)..... radifera (Coquillett)
 Apex of anterior basal cell with a small fuscous spot near inner
 cross vein..... 40
40. Third wing vein with one or two weak hairs at base below.
 californica, new species
 Third wing vein with minute hairs below from base to inner cross
 vein..... microsetulosa, new species

¹ This, I believe, will prove to be a new species, but since the materials are unsatisfactory as a basis for description it is here left in doubt.

FIGURE 1.—a, *Trypanea eugenia* (after van der Wulp); b, *T. stigmatica*, type; c, *T. ageratae*, type; d, *T. peruviana*, type; e, *T. eclipta*, type; f, *T. nigricornis*, type; g, *T. imperfecta*, type, male; h, *T. imperfecta*, female; i, *T. femoralis*, male; j, *T. radifera*, type, male; k, *T. radifera*, female; l, *T. microstigma*, male; m, *T. microstigma*, female; n, *T. conjuncta*, male; o, *T. bisetosa*, male; p, *T. bisetosa*, female; q, *T. vicina*; r, *T. texana*, types; s, *T. mevarna*; t, *T. dacotopetra*; u, *T. jonesi*, female; v, *T. arizonensis*, type; w, *T. erasa*, female; x, *T. actinobola*.

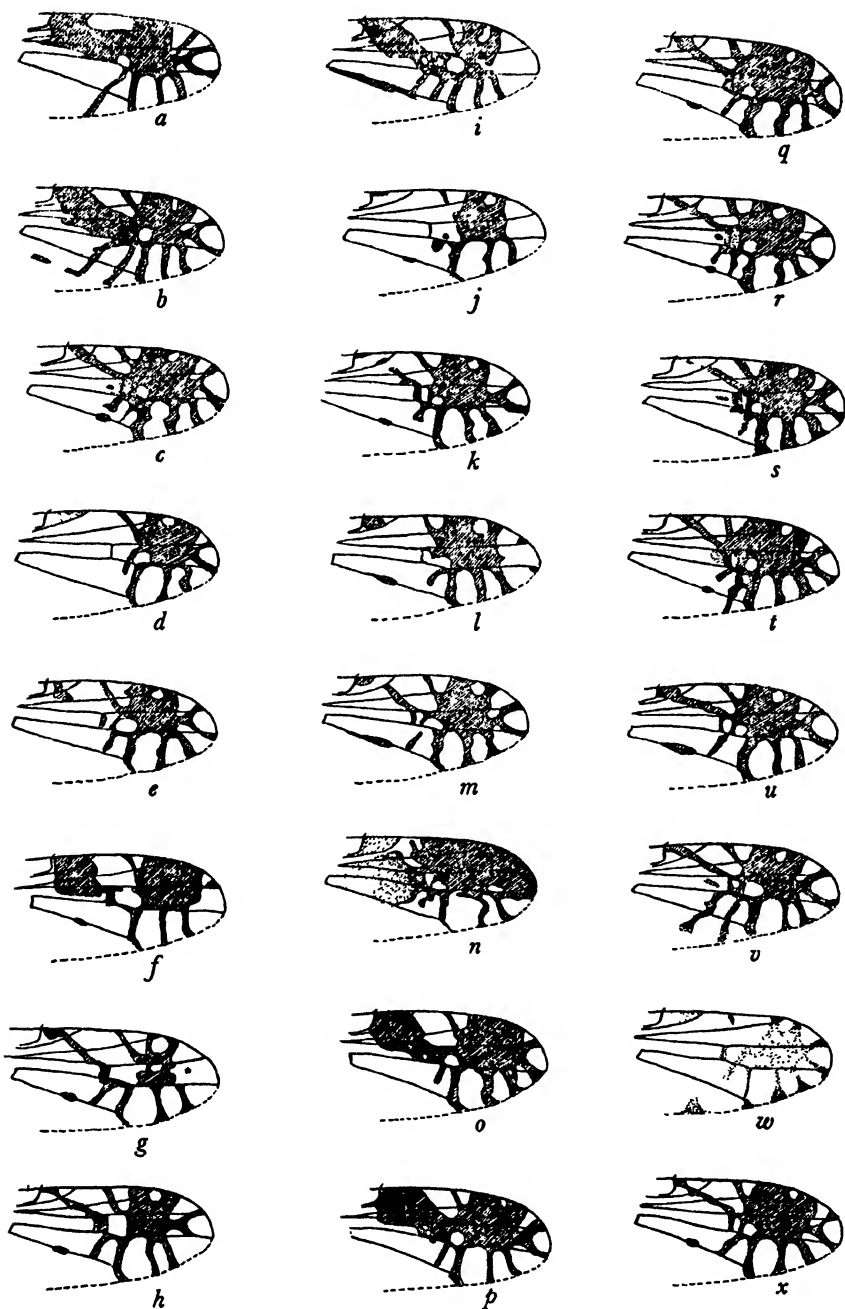


FIGURE 1.—WINGS OF SPECIES OF TRYPANEA

(For explanation see opposite page)

TRYPANEA EUGENIA (van der Wulp)

1900. *Urellia eugenia* VAN DER WULP, Biologia Central-Americana, Diptera, vol. 2, p. 427, fig.

This species, which is unknown to me, is described as differing from all others in the genus by its rufous coloration and the extension of the black spots on the wings, thorax and abdomen grayish, but appearing rufous on account of a dense ochraceous dust, and with short yellow hairs. The wing markings are distinctive though of the same general type as in *stigmatica* and a few others not at that time known to van der Wulp (fig. 1, *a*).

Described from Guerrero, Mexico.

TRYPANEA STIGMATICA (Coquillett)

1899. *Urellia stigmatica* COQUILLETT, Journ. New York Ent. Soc., vol. 7, p. 268.

This species differs from all the others contained in this paper except *eugenia* in having a short pair of apical scutellar bristles and the wing markings as in figure 1, *b*. There is some variation in the extent of the two dark rays that cross the discal cell, the normal type being that figured but sometimes there are other fainter markings basally and the small mark in front of the anterior inner ray may be connected with the latter, with one or two minute hyaline dots in the disk of the large black preapical mark.

The most remarkable variation from type is seen in a female specimen from Nevada, which has a rather wide fuscous cloud from the anterior ray along the fifth vein to its base, and the posterior ray just in front of the outer cross vein ceasing at the fifth vein. There is a possibility that this may be a distinct species.

Originally described from Colorado, from which State there is another specimen in the National Museum collection, as well as others from New Mexico, California, Texas, and Idaho. The Bryant collection contains specimens from Arizona.

TRYPANEA AGERATAE Benjamin

1934. *Trupanea ageratae* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 56, fig. 40.

This species was described from a unique male, now in the collection of the National Museum (No. 54386), that was reared from a larva feeding in the flowers of *Ageratum littorale* on No Name Key, Fla. Wing as in figure 1, *c*.

TRYPANEA PERUVIANA, new species

Male.—Very similar to *eclipta* in most respects, differing from it in having the basal segment of the fore tarsus about twice as long

as thick, with some downwardly directed dark hairs at base of the ventral surface that are longer than the diameter of the segment, less evident hairs on the anterior side of the intermediate segments, the fore tibia more swollen and with the dorsal series of erect hairs more distinct and decidedly stronger. There are no outstanding bristles on the anterior surface of the mid femur. The wing pattern differs also in having only a yellow suffusion in the stigma and no appreciable cloud on the inner cross vein (fig. 1, *d*).

Length, 2 mm.

Type and one paratype male, Arequipa, Peru, August 21 (Cockrell), U.S.N.M. No. 54385.

TRYPANEA ECLIPTA Benjamin

1934. *Trupanea eclipta* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 57, fig. 42.

1914. *Trypanea metoica* HENDEL, Abh. Ber. Zool. Mus. Dresden, vol. 14, p. 79. (?)

The male of this species has the fore tarsus shorter and stouter than in the other species except the two immediately above, with fine outstanding hairs on the anterior edge of the second to fourth segments, some of them distinctly longer than the width of the segments, the basal segment thickened and but little longer than wide, with a tuft of stiff yellow hairs on the underside at apex that projects forward against the ventral surface of the second segment. The fore femora in all three species of this group are thickened and have a few very short posteroventral bristles on the apical half, while the mid femur lacks the anteroventral bristles and has the anterior central series almost undeveloped.

In a few specimens there are one or two microscopic hairs on the third wing vein below about midway between the base and the inner cross vein, and in more there are one or two hairs at base below that are sometimes yellow.

Wing markings usually as shown in figure 1, *e*, a dark fascia near apex of the discal cell, but sometimes this is reduced to a mere spur against the fourth vein. In a few specimens there are a number of minute hyaline dots in the large black preapical mark, and in no case is the dark discal mark connected with the latter by a diagonal ray.

Locality, Orlando, Fla., August–November, reared from larvae feeding in flowers of *Eclipta alba*, by D. J. Nicholson.

Holotype, allotype, and 178 paratypes, U.S.N.M. No. 54383. Benjamin states that he had, besides the holotype and allotype, 170 paratypes, but there are 178 in the collection.

TRYPANEA NIGRICORNIS (Coquillett)

1899. *Urellia nigricornis* COQUILLETT, Journ. New York Ent. Soc., vol. 7, p. 266.

Described from a male in the National Museum collection taken in Colorado.

The third antennal segment is deep black in the male, but in the females I have examined this segment is not much darker than the basal two. The frontal bristles in the male are much shorter than those of the female, the ocellars not attaining to the bases of the upper pair of infraorbitals, and the wing markings are as in figure 1, *f*.

The male has some well-developed anteroventral bristles on the apical half of the mid femur. In both sexes all the hairs and bristles on the abdomen are whitish yellow. Third wing vein with at most one or two hairs at extreme base below.

Represented in the National Museum collection by specimens from Idaho, Wyoming, and Utah. In the Bryant collection there are specimens from Arizona.

TRYPANEA IMPERFECTA (Coquillett)

1902. *Urellia imperfecta* COQUILLETT, Journ. New York Ent. Soc., vol. 10, p. 181.

Originally described from a male specimen taken at Williams, Ariz. There is a female in the National Museum collection from the same locality and with the same data, but Coquillett did not associate this specimen with the type male.

I figure the wing of the latter and also that of the female to show the sexual differences in markings (figs. 1, *g*, *h*).

The fore tarsi of the male are normal in form and armature, the basal segment being at least three times as long as thick, there are no well-developed bristles on the anterior surface of the mid femur in either sex, and the frontal bristles of the male are very much shorter than those of the female. I can detect only one or two minute stiff hairs at the base of the third wing vein above and below.

There are only the above mentioned two specimens in the National Museum.

TRYPANEA FEMORALIS (Thomson)

1868. *Trypeta femoralis* THOMSON, Kongliga Svenska Fregatten Eugenies Resa Omkring Jorden, Diptera, p. 582.

There is a male specimen in the National Museum collection from Santa Clara, Calif., identified by Coquillett as this species that I accept as correctly identified.

It belongs to the group in which the Y-shaped black mark at the apex of the wing is undeveloped, the tips of the third and fourth veins being unclouded (fig. 1, *i*). The extension of the black mark

along the fifth vein to its base is unique in this group except in the case of the single aberrant female mentioned under *stigmatica*. The mid femur has some rather strong anteroventral bristles beyond the middle, as mentioned by Thomson.

The specimen is but 3 mm. in length; Thomson gives 4 mm. as the length of his specimen.

Original locality, California.

TRYPANEA RADIFERA (Coquillett)

1899. *Urellia radifera* COQUILLETT, Journ. New York Ent. Soc., vol. 7, p. 267. (Male.)

1932. *Trypanea hebes* CURRAN, Amer. Mus. Nov., No. 556, p. 9, fig. 7. (Female.)

I figure the wing of the male and female (fig. 1, *j*, *k*).

The male has the frontal bristles much shorter than does the female, the ocellars not extending quite to the bases of the upper pair of infraorbitals, the mid femur with a number of dark anteroventral bristles on the apical half that increase in length as they advance toward the apex, and the apical Y-shaped mark on the wing undeveloped.

The female has no strong anteroventral bristles on the mid femur and the black apical Y-shaped mark on the wing is entire. There are frequently some microscopic setulae from base to near inner cross vein on the underside of the third wing vein, and the brown mark on the fifth vein near middle of the discal cell is usually more elongate in the female than in the male.

There can be no question of the association of the sexes as I have a pair taken in copula by me at Medicine Hat, Alberta.

Originally described from Tucson, Ariz., and in the National Museum collection there are specimens from New Mexico, Colorado, Texas, Idaho, South Dakota, and Alberta.

TRYPANEA MICROSTIGMA Curran

1932. *Trypanea microstigma* CURRAN, Amer. Mus. Nov., No. 556, p. 7, fig. 8. (Female.)

The male has the black Y-shaped mark at apex of the wing undeveloped, sometimes represented by black dots at apices of the third and fourth veins as in figure 1, *l*, while the female has this mark usually entire as in figure 1, *m*. The black stigmal mark is larger in the male than in the female, extending entirely across the cell.

In the male there are several rather strong blackish bristles on the anterior surface of the mid femur that are as in the other species having such bristles almost on the anteroventral surface of apical half, and as usual in this section of the genus the frontal bristles are much shorter in the male than in the female.

Originally described from two females taken at Crater Lake, Oreg.

In the National Museum collection there are specimens from the following localities: Wells, Nev.; Tuttle and Oakley, Idaho; Mount Hood, Oreg.; Ellery Lake, Pine Lake, and Adelanto, Calif. The two Idaho specimens bear numbers 10 and 10b, with the name "*S. pestifer*" (D. E. Fox) on the label.

TRYPANEA CONJUNCTA (Adams)

1904. *Urellia conjuncta* ADAMS, Kansas Univ. Sci. Bull., vol. 2, pp. 450, 451-452.

Originally described from a female taken at Bill Williams Fork, Ariz. I am describing below the male of the species.

Male.—Differs from all the known North American species of the genus in the reduction of the number of hyaline marks in the margin of the wing, the entire costa from the middle of the marginal cell to just below the apex of fourth vein being entirely brownish black (fig. 1, *n*). The frons is remarkable not only in the very weak and short bristles, but in having five or six pairs of fine, short, and exceptionally closely placed incurved infraorbitals.

The fore tarsi are shorter than usual, but the basal segment is at least three times as long as thick and there are no exceptional hairs on the intermediate segments, the midfemur has no well-developed anteroventral bristles on the apical half, the hind tibial series of setulae is weak, and there are a few microscopic hairs on the basal section of the third vein on its underside. Length, 4 mm.

White Mountains, Ariz., July 7, 1933 (O. Bryant collection).

TRYPANEA BISETOSA (Coquillett)

1899. *Urellia bisetosa* COQUILLETT, Journ. New York Ent. Soc., vol. 7, p. 266.

This species is readily distinguished from any other but *nigricornis* in the group with but two scutellar bristles by the broad black band that extends from the costal margin of the stigma obliquely backward to the inner cross vein (fig. 1, *o, p*).

The male is at once distinguished from that of *nigricornis* by the entirely yellow antennae, but the female is not so readily distinguished as it has the antennae sometimes entirely yellow or at most has the third segment brownish and not black. Only one or two hairs are present at the extreme base of the third vein below in both sexes.

The species was originally described from a female from Las Cruces, N. Mex., and a male from Marysvale, Utah.

The female is labeled "Type," but there are a male and a female from Marysvale that have no type labels on them, and apparently the male is the one listed by Coquillett. It is unquestionably a male of *nigricornis*, but it is in fragmentary condition and the antennae are missing.

There are many specimens of both sexes in the National Museum collection from Torreón and Tlalimalilo, Mexico, and a few from California, Colorado, Idaho, New Mexico, and Nevada.

TRYPANEA VICINA (van der Wulp)

1890. *Urellia vicina* VAN DER WULP, Biología Central-Americana, Diptera, vol. 2, p. 427, fig.

Very similar to *actinobola* in most characters, but the apex of the anterior basal cell of the wing is dark brown (fig. 1, *q*). Structurally the male differs from that of Loew's species in having the frontal bristles longer and stronger, the ocellar pair attaining to the bases of the upper infraorbital pair, and the mid femur with no outstanding anteroventral bristles on the apical half. There are also usually some microscopic hairs on the underside of the third wing vein from base to near the inner cross vein.

Originally described from two females from Orizaba, Mexico. In the National Museum there are a male from Brewster County, Tex., one female from Victoria and one from Devils River, Tex., and two females from San Francisco, Calif.

TRYPANEA TEXANA, new species

Male and female.—This species agrees very closely with the description of *polyclona* (Loew), which is unknown to me and not included in this paper. It is said by Loew to have two pairs of scutellar bristles and must belong with *stigmatica* and *eugenia*. The present species is very similar to that figured by van der Wulp as *polyclona* in 1890 (p. 427), but in no case in the series before me is the anterior one of the two dark rays through the discal cell entire. In every specimen this ray is broken before it reaches the fifth vein, usually being represented on the vein by a dot; the other ray is also usually broken beyond middle of the cell, but in two specimens it is entire (fig. 1, *r*).

The male has the frontal bristles short, the ocellars not attaining to bases of the upper infraorbitals, and in neither sex are there anteroventral bristles on the mid femora. The third wing vein has hairs below from base to near the inner cross vein.

Length, 3 mm.

Holotype male, Arlington, Tex., June 12, 1907 (Bishop); allotype and 6 female paratypes, Dallas, Tex., U.S.N.M. No. 54401.

A female specimen from Las Visayas, Chihuahua, Mexico, differs from the above in having the inner ray through the discal cell entire and carried along the fifth vein for a short distance but not to the bases of the discal cell. It is not *occidentalis* Adams.

TRYPANEA MEVARNA (Walker)

1849. *Trypeta* (*Urellia*) *mevarna* WALKER, List of the specimens of dipterous insects in the collection of the British Museum, pt. 4, p. 1023.
1862. *Trypeta solaris* LOEW, Monographs of the Diptera of North America, vol. 1, p. 84, pl. 2, fig. 19.
1934. *Trupanca mevarna* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 54.

Closely similar to *dacetopectera*, having the frontal bristles of the male long, the anteroventral bristles lacking on the mid femora, and the third wing vein with some widely separated hairs below from base to near inner cross vein in both sexes. The distinctions in both sexes are in the wing markings, particularly in the shorter dark fascia in front of the outer cross vein, which ceases at the fifth vein (fig. 1, s).

There is a photograph of the wing of Walker's type specimen in the National Museum that agrees with the wing of the species before me.

It is evident from a few aberrant specimens that *mevarna* and *dacetopectera* are more closely related to each other than they are to some other species, as the complete fascia through the discal cell is not an infallible distinguishing character; one specimen has it complete on one wing and ceasing at the fifth vein on the other, and in two specimens of *mevarna* there is a detached dark spot on the edge of the wing below the abbreviated fascia.

Walker's type came from Florida, Loew's type of *solaris* from Georgia.

There are many specimens of both sexes in the National Museum collection from a number of localities in Florida reared from larvae found feeding in the flowers and tender tips of plants of the genus *Chrysopsis*.

Records of the occurrence of this species from other localities should be checked to insure correct identification.

TRYPANEA DACETOPTERA Phillips

1923. *Trypanea dacetopectera* PHILLIPS, Journ. New York Ent. Soc., vol. 31, p. 148.
1934. *Trupanea dacetopectera* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 54, fig.

This species is readily distinguished from any other in the eastern United States by the continuation to the hind margin of the wing of the outer dark ray through the discal cell (fig. 1, t). The wing markings in the sexes are similar, and there is considerable variation in the extent of the dark markings in front of the inner cross vein in the apex of the anterior basal cell, and in the form of the dark markings in front of the complete dark ray through the discal cell.

In the male the frontal bristles are nearly as strong as in the female, the ocellars almost or quite attaining the bases of the upper

pair of infraorbitals. The mid femora lack well-developed bristles in both sexes, and the third wing vein is almost invariably sparsely haired below from its base to near the inner cross vein.

Originally described from New York and recorded from New England. The National Museum collection contains a large number of specimens from Orlando, Fla., all with one exception reared from larvae mining in *Gnaphthalium obtusifolium*. The exception bears a label indicating that it was from *Chrysopsis microcephala*. This may be an error.

TRYPANEA JONESI Curran

1932. *Trypanea jonesi* CURRAN, Amer. Mus. Nov., No. 556, p. 6, fig. 6.

Described from female specimens and compared with *actinobola*, from which it was distinguished by the elongate dark mark on the fifth wing vein and the more extensively blackened stigma. The abdomen is also stated to be more shiny and the head distinctly shorter. These characters hold good for the specimens before me, and the anterior pair of infraorbital bristles are also longer than in Loew's species. Wing as in fig. 1, *u*.

I have seen no male that I can identify as belonging to this species.

Originally described from various localities in Oregon and from Jackson Lake, Wyo. In the National Museum collection there are three females with data as follows: Ormsby County, Nev. (Baker); National Park, Wyo.; and Pasadena, Calif. (Grinnell).

TRYPANEA ARIZONENSIS, new species

Female.—Similar to *dacetopectera* in general features, the thorax and abdomen densely gray dusted, the former without a trace of dark vittae, and the abdomen but slightly shiny, the antennae and legs tawny-yellow. In no specimen is there any trace of anterior bristles on the mid femur, and the third wing vein has usually two or more widely separated microscopic stiff hairs below between base and the inner cross vein.

Wings markings as in figure 1, *v*, readily distinguishing it from any other in this group, none having two dark fasciae through the discal cell that extend beyond the fifth vein. In *stigmatica* there are two similar fasciae, but in that species there is a broad black band between the stigma and the inner cross vein, and there are two pairs of scutellar bristles, the apical pair much shorter than the basal.

Length, 3 mm.

Type and 6 paratypes, Tucson, Ariz., February 25, 1934, lot 429 (O. Bryant collection).

TRYPANEA ERASA, new species

Female.—Head and legs dull testaceous-yellow, inner vertical, ocellar, and orbital bristles except the upper supraorbital yellowish brown, the latter and the other cephalic hairs and bristles yellowish white. Ocellars long, extending to bases of the upper pair of infraorbitals, the infraorbitals in three pairs.

Thorax black, humeri and pleura paler, mesonotum densely lead-gray dusted, without dark vittae, humeri, pleura, and scutellum yellowish gray dusted. The strong bristles yellowish brown, others and the decumbent scalelike hairs whitish yellow.

Legs normal, yellowish testaceous including the hind coxae. Mid femora not bristled in front.

Wings grayish hyaline, with very faint dark markings as in figure 1, *w*, the central portion of the usual preapical star-shaped mark yellow, only the apices of the rays on the wing margin fuscous. Third vein bare or with at most one or two microscopic hairs at extreme base.

Abdomen colored as mesonotum, densely gray dusted, slightly shiny, sheath of the ovipositor glossy black, the hairs rather long and whitish yellow except on apex of the sheath.

Length, 2 mm.

Holotype, Lima, Peru, 1914 (Parish), U.S.N.M. No. 54384.

TRYPANEA ACTINOBOLE (Loew)

1873. *Trypeta actinobola* LOEW, Monographs of the Diptera of North America, vol. 3, p. 326.

1934. *Trupanea actinobola* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 56, fig. 41.

As at present accepted this may be a complex of closely related species, but intensive field and laboratory work is required to determine the status of specimens from different sections of the country and reared from different food plants.

The wing markings vary but little in the series before me, but the fifth vein has sometimes no dark spot near the middle of the discal cell (fig. 1, *x*). The frontal bristles of the male are short, and the mid femur of the same sex has a number of rather long bristles on the apical half of the anteroventral surface.

Originally described from Texas. I have before me specimens from Texas, New Mexico, California, Kansas, Arkansas, Indiana, Georgia, Florida, and Mexico.

Recorded food plants of the larvae are species of *Erigeron*, *Solidago*, *Aster*, *Coreopsis*, *Hieracium*, and *Actinospermum*.

TRYPANEA CALIFORNICA, new species

Male and female.—Very similar to *actinobola*, the wing pattern being almost identical, with the exception that the dark streak through the stigma is much less distinct.

The much longer and stronger frontal bristles, especially the ocellar pair that reaches the bases of the upper infraorbital pair, readily distinguish the male from that of the other species. There are one or two short stiff hairs at the base of the third vein on its underside.

Length, 2.5 mm.

Type male, allotype, and 2 paratypes, Emerald River, Tahoe, Calif., June 30, 1927 (Aldrich), U.S.N.M. No. 54399.

TRYPANEA MICROSETULOSA, new species

Male.—Agrees very closely with *californica* but has a widely spaced series of microscopic stiff hairs on the underside of the third wing vein from base to a little beyond the inner cross vein.

Length, 2.75 mm.

Holotype, Lakeside, Tahoe, Calif. (Aldrich), U.S.N.M. No. 54400.

TRYPANEA OCCIDENTALIS (Adams)

1904. *Urellia occidentalis* ADAMS, Kansas Univ. Sci. Bull., vol. 2, pp. 450, 452-453.

This species is unknown to me except from the description. It was described from both sexes. The male has the Y-shaped black mark on the wing developed; there are two black rays or fasciae through the apical half of the discal cell, the inner one connected with a dark border along the fifth vein to the base of the discal cell. I have found this marking present in only *femoralis* Thomson of this group, but in it the Y-shaped black apical wing mark is absent in the male, and the ray from the stigma to the inner cross vein is not so wide as the first posterior cell. There are several species that have two dark rays through the apical half of the discal cell, but none of this group known to me appears to be *occidentalis*.

TRYPANEA WHEELERI Curran

1932. *Trypanea wheeleri* CURRAN, Amer. Mus. Nov., No. 556, p. 7, fig. 1.

This species was described from females only and is very similar to *jonesi*, being distinguished therefrom only by having a narrow brown mark across the apex of the anterior basal cell of the wing against the inner cross vein. Curran's figure shows this brown mark as extremely narrow, there being very little difference between the figures of the wings of the two species.

Type locality, San Diego County, Calif.

I am accepting as this species a female that has the wings marked as in Curran's figure, but there is no subhyaline mark close against the posterior side of the inner cross vein, the apex of the anterior basal cell is more widely dark, and the brown mark on the fifth vein extends to the base of the discal cell. The hairs on the pleura and sides of the abdomen are orange-yellow, and the third vein is bare below.

Locality, Sierra Morena Mountains, Calif., April 2, 1906 (Aldrich coll.).

Genus NEASPILOTA Osten Sacken

1878. *Neaspilota* OSTEN SACKEN, Catalogue of the described Diptera of North America, ed. 2, p. 192. (As a subgenus of *Trypeta*.)

1910. *Neaspilota* COQUILLETT, Proc. U. S. Nat. Mus., vol. 37, pp. 511, 574. (Type designated as *Trypeta alba* Loew.)

1934. *Neaspilota* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 34.

Benjamin, in the paper above referred to, described two species of the genus and gave a key to the described species that was based entirely upon color characters. He failed to label his species in the collection, and no type catalog numbers were given. I have sorted out his species, and numbers have herein been allotted them.

In no paper dealing with the genus is there any mention of the fact that the claws of the fore tarsi of the males are asymmetrical. The inner or anterior claw is much larger and stronger than the outer one in that sex, while there is no appreciable difference in the claws of the female. The upper supraorbital bristle is sloped inward in all the species.

I give below a key to the species, with added male characters that will augment the one given by Benjamin. The armature of the legs has not been previously used.

KEY TO THE SPECIES OF NEASPILOTA

1. Wing with several fuscous marks in addition to the one in the stigma: one in the marginal cell directly below the stigmal one and connecting with it, a more or less complete fascia from the costa before the apex of the second vein over the outer cross vein, a spot over the tip of the second vein and another over the tip of third, a cloud on the inner cross vein, and usually some fainter marks in the first posterior cell... 2
- Wing with at most the stigma distinctly blackened, no dark clouds through or in the other cells though sometimes the cross veins may be darker than connecting parts of the longitudinal veins..... 3
2. Hairs on the dorsum of the abdomen yellow; no distinct black mark on lower half of the sternopleura or on the centre of the anterior margin of the thorax; the fuscous mark near apex of the first posterior cell carried entirely across the cell..... *vernoniae* (Loew)

- Hairs on dorsum of the abdomen dark brown or black; lower half of the sternopleura and a mark in centre of the anterior margin of the thorax black; the fuscous mark near apex of the first posterior cell of the wing interrupted in middle of the cell----- *achilleae* Johnson
3. Hind tibia of the male with two minute erect stiff hairs at the apex on the anteroventral surface that project downward, the hind femur in same sex without erect hairs on the ventral surface, mid femur with short fine erect hairs basally; stigma of wing in both sexes with a distinct dark spot in basal third----- *punctistigma* Benjamin
- Hind tibia of the male without any short erect hairs at apex of the anteroventral surface; other characters not as above----- 4
4. Hairs on the dorsum of the abdomen except those on the basal compound tergite dark brown; stigma yellowish brown, usually paler behind; mid and hind femora of the male without erect outstanding ventral hairs; wing veins brown except at bases; interocellar region infuscated----- *albidipennis* (Loew)
- Hairs on the dorsum of the abdomen yellow; other characters not as above----- 5
5. Stigma entirely yellowish hyaline, and the veins entirely pale yellowish-- 6
- Stigma entirely or basally browned or infuscated, the cross veins and a short section of the connecting veins each side of them usually darker than the central portions of the third and fourth veins----- 7
6. Mid and hind femora of the male with some fine outstanding hairs on the ventral surfaces, most noticeable basally; the series of minute setulae on the anterodorsal surface of the hind tibia practically undeveloped; stigma of the wing narrow----- *dolosa* Benjamin
- Mid and hind femora of the male without erect fine ventral hairs; the series of minute anteroventral setulae on the hind tibia well developed; stigma wide----- *alba* (Loew)
7. Stigma fuscous or brownish yellow on basal third or more, and the cross veins darker than the greater portion of the longitudinal veins; a slight dark cloud at base of the costal cell; mid and hind femora of the male not furnished with outstanding ventral hairs; the anterodorsal series of minute setulae on the hind tibia rather inconspicuous and not closely placed----- *signifera* Coquillett
- Stigma almost entirely fuscous or brown, paler behind; mid and hind femora of male not furnished with outstanding ventral hairs; hind tibia with the series of anterodorsal setulae stronger and more closely placed----- *brunneistigma* Doane

NEASPILOTA PUNCTISTIGMA Benjamin

1934. *Neaspilota punctistigma* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 38.

The describer, to avoid having a mixed-type series, restricted the type materials to the specimens reared from larvae feeding in *Pluchea foetida* and included besides the holotype male and allotype 70 paratypes, all from Florida localities. There are many other specimens in the collection.

Type, U.S.N.M. No. 54402.

NEASPILOTA DOLOSA Benjamin

1934. *Neaspilota dolosa* BENJAMIN, U. S. Dept. Agr. Techn. Bull. 401, p. 39.

The type materials were restricted by the describer to specimens reared from *Heterotheca subaxillaris* of which there are besides the holotype male and allotype 150 paratypes. There are many other specimens in the collection, all from Florida localities.

Type, U.S.N.M. No. 54403.



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THE FREDA, N. DAK., METEORITE: A NICKEL-RICH ATAXITE

By E. P. HENDERSON and STUART H. PERRY

WHILE plowing sod in May 1919, Henry G. Meyer, of Shields, N. Dak., found a unique little meteorite, weighing 268 grams, 2 miles southwest of Freda, N. Dak. (lat. $46^{\circ}23'$ N., long. $101^{\circ}14'$ W.). Although not a witnessed fall, it must be a fairly recent one, as the external surface is fresh and has some of the fused crust still attached.

It is a beautifully oriented individual (see pl. 1), exhibiting the flight markings as perfectly as in any iron meteorite with which the authors are familiar. In front of it the air was heated sufficiently to soften the metal and cause it to flow. The rounded end was the forward face, and some of the delicately carved furrows curve upward toward the crown, while others run down the sloping sides from the front face. The concave side, assumed to be the under side in the flight, is also marked by similar features.

The metal at the edge is rolled over and down on the concave side as if it had been hammered down, and perhaps it was—driven down by the resistance of the air. Since this overhanging metal fringe is covered with the delicate flight markings, it gives positive evidence that this feature is a phenomenon of the flight and not of its striking the earth.

From the color of the metal one might suspect that it has a high nickel content. A thin slice was removed from the rear of the sample and polished for study. After completion of the metallurgical study, this slice was analyzed. Table 1 gives the chemical composition of

the Freda meteorite and also, for comparative purposes, that of other known nickel-rich ataxites.

The general structure of the Freda meteorite is that of an ataxite. It consists of a fine, acicular groundmass in which are scattered abundant spindles and particles of kamacite. In appearance this acicular structure is similar to martensite in artificial irons and probably had an analogous origin, for owing to the high nickel content the gamma-alpha transformation was greatly depressed. After the initial transformation, when the kamacite had separated, the remaining gamma solid solution underwent only a partial transformation and the kamacite was very sparingly precipitated on octahedral planes, producing an acicular structure similar to that observed in many octahedrites.

Plate 1 shows in natural size the flight markings of this meteorite.

Plate 2, figure 1, illustrates the general structure at low magnification. The kamacite inclusions are surrounded by clear (white) zones, which are areas of taenite from which the kamacite has been attracted to the larger masses. In other words, there has been an impoverishment of the kamacite in these areas and an accumulation of it into masses. Many of these kamacite areas contain inclusions of a rounded iron-phosphide eutectic. The general acicular groundmass exhibits the martensite structure.

TABLE 1.—*Chemical analysis (in percentages) of the Freda meteorite and other nickel-rich ataxites*

Substance	Freda	Limestone Creek		San Cristobal		Santa Catharina	Oktibbeha	
	(E. P. Henderson, analyst)	(R. Knauer, analyst) ¹	(C. T. Jackson, analyst) ²	(O. Sjostrom, analyst) ³	(E. Cohen, analyst) ⁴	(A. A. Damour, analyst) ⁵	(W. J. Taylor, analyst) ⁶	(E. Cohen, analyst) ⁷
Fe.....	75. 86	65. 03	66. 56	73. 72	73. 56	63. 69	37. 69	37. 24
Ni.....	23. 49	29. 99	24. 70	25. 60	25. 44	33. 97	59. 69	62. 01
Co.....	. 66	1. 48	-----	1. 00	1. 00	1. 48	. 40	. 72
P.....	. 15	. 19	-----	. 18	-----	. 05	. 10	. 15
S.....	Trace	-----	4. 00	-----	-----	. 16	-----	-----
Insoluble.....	. 07	. 20	-----	-----	-----	. 01	-----	-----
Cl.....	-----	-----	1. 48	-----	-----	-----	-----	-----
Cr and Mn.....	-----	-----	3. 24	-----	-----	-----	-----	-----
C.....	-----	-----	-----	-----	-----	. 20	-----	-----

¹ Meteoritenkunde, 1905, No. 3, p. 131.

² Amer. Journ. Sci., vol. 34, p. 335, 1838.

³ Sitz. Akad. Wiss. Berlin, 1898, p. 607.

⁴ Meteoritenkunde, 1905, No. 3, p. 135.

⁵ Compt. Rend. Acad. Sci. Paris, vol. 84, p. 43, 1877.

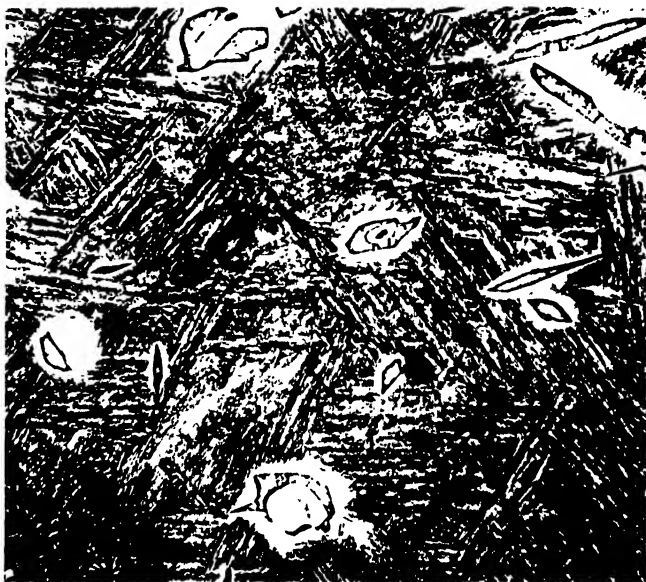
⁶ Amer. Journ. Sci., ser. 2, vol. 24, p. 293, 1857.

⁷ Ann. Naturh. Hofmus. Wien, vol. 7, p. 146, 1892.

⁸ J. G. Fairchild, U. S. Geological Survey, determined by methods different from those used by the author the nickel content of the same sample and reports 23.27 percent.



Two views of the Freda, N. Dak., meteorite. Natural size.



1. Groundmass of Freda meteorite, showing martensite structure and kamacite inclusions surrounded by white areas of taenite. Picral etching. $\times 100$.



2. Invasion of fusion into the meteorite. Picral etching. $\times 100$.



1. Freda meteorite: Kamacite arranged in octahedral pattern. Picral etching
 $\times 100$.



2. Invasion of oxide into the kamacite. Picral etching. $\times 100$.



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SOME CESTODES FROM FLORIDA SHARKS

By ASA C. CHANDLER

THE four cestode worms herein reported were collected by Stewart Springer, of the Zoological Research Supply Co., from sharks taken off the Gulf coast of Florida near Englewood. Two of them—*Dasyrhynchus insigne* and *Nybelinia palliata*—have previously been reported from the same or related hosts at Woods Hole, Mass.; *Diplobothrium springeri* represents a new genus and species and is the second tetrarhynchidean known with double sets of reproductive organs; and the other, *Thysanocephalum rugosum*,¹ is a new species from the same host as *T. thysanocephalum*.

Genus **THYSANOCEPHALUM** Linton

THYSANOCEPHALUM RUGOSUM, new species

FIGURE 2, a-d

Two specimens of this worm were obtained from the spiral valve of a tiger shark, *Galeocerdo arcticus*; one had a total length of 48 cm. and had mature but not ripe segments at its end, while the other was only 14 cm. long and showed no evidence of segmentation. Neither specimen showed any trace of the true scolex such as occurs in the other species of *Thysanocephalum*, but the general character of the worm, the structure of the pseudoscolex, and the anatomy of the mature segments leave no doubt concerning the close affinity of this worm with members of the genus *Thysanocephalum*. It can only be conjectured that the true scolex has been lost or atrophied in these specimens.

Specific description.—Pseudoscolex very highly developed, and complexly crinkled as in old specimens of *T. thysanocephalum*, but larger than in that species, measuring 2.8 to 4.2 mm. across.

Neck 2 to 3.3 mm. broad at junction with pseudoscolex, narrowing rapidly to a diameter of 1.4 to 1.7 mm. less than a centimeter from the head. This diameter is uniformly maintained for a long distance but gradually increases again to a diameter of about 3 mm., which is maintained throughout most of the length of the worm. Total length of longest strobila 48 cm. Cuticle of entire strobila marked by chitinous reticulations about 5μ to 7μ thick, enclosing irregular spaces 50μ to 120μ across and giving a peculiar and very characteristic scaly appearance. Apparently three pairs of longitudinal excretory ducts are present: A very broad ventral one accompanied by a narrow dorsal one, dividing the segment transversely about 1:2:1, and an additional pair of fairly broad outer ducts much nearer the margins. Segmentation begins between 15 and 20 cm. from head. At 25 cm. the segments are 0.2 to 0.25 mm. long; at 40 cm., 0.7 mm. long; and at 45 cm., 1.5 mm. long. No ripe segments present.

Genital pores irregularly alternate, majority opening at left, situated a little behind middle of lateral margin. Cirrus sac very long (1.3 mm.) and in oldest segments 450μ broad, curving forward. Vas deferens much coiled, especially after leaving cirrus pouch, where the coils occupy the area bounded by the cirrus pouch, anterior loop of vagina, and uterus. Testes very numerous, about 60μ to 80μ in diameter, occupying practically all available space between the outer excretory ducts. Vagina lies just anterior to cirrus pouch, with its mouth just in front of the opening of the pouch. Its distal portion is enlarged with thickened walls, narrowing to a thin-walled tube just inside the inner excretory ducts; it makes a broad curve forward and then continues sinuously along the midline toward the posterior end of the segment. Here it has several loops, surrounded by Mehlis's gland. The ovaries extend across the posterior part of the segment between the outer excretory ducts, each one about 900μ broad and 300μ anteroposteriorly. The uterus runs forward dorsal to the vagina on the median line; it develops into a series of kinks, which

FIGURE 2.—NEW CESTODES FROM FLORIDA SHARKS.

- a-d. *Thysanocephalum rugosum*, new species: a, Pseudoscolex; b, portion of pseudoscolex much enlarged, showing thickened crinkled edges; c, mature segment about 45 cm. from head, cuticle and layer of yolk glands stripped off; d, younger segment about 30 cm. from head.
- e-i. *Diplobothrium springeri*, new genus and species: e, Scolex; f, mature segment about 28 cm. from head, cuticle and layer of yolk glands stripped off; g, ripe segment about 40 cm. from head, cuticle and layer of yolk glands stripped off; h, portion of proboscis indicated by "A" on fig. i, from opposite side; i, partially everted proboscis, shaded part indicating invaginated portion.

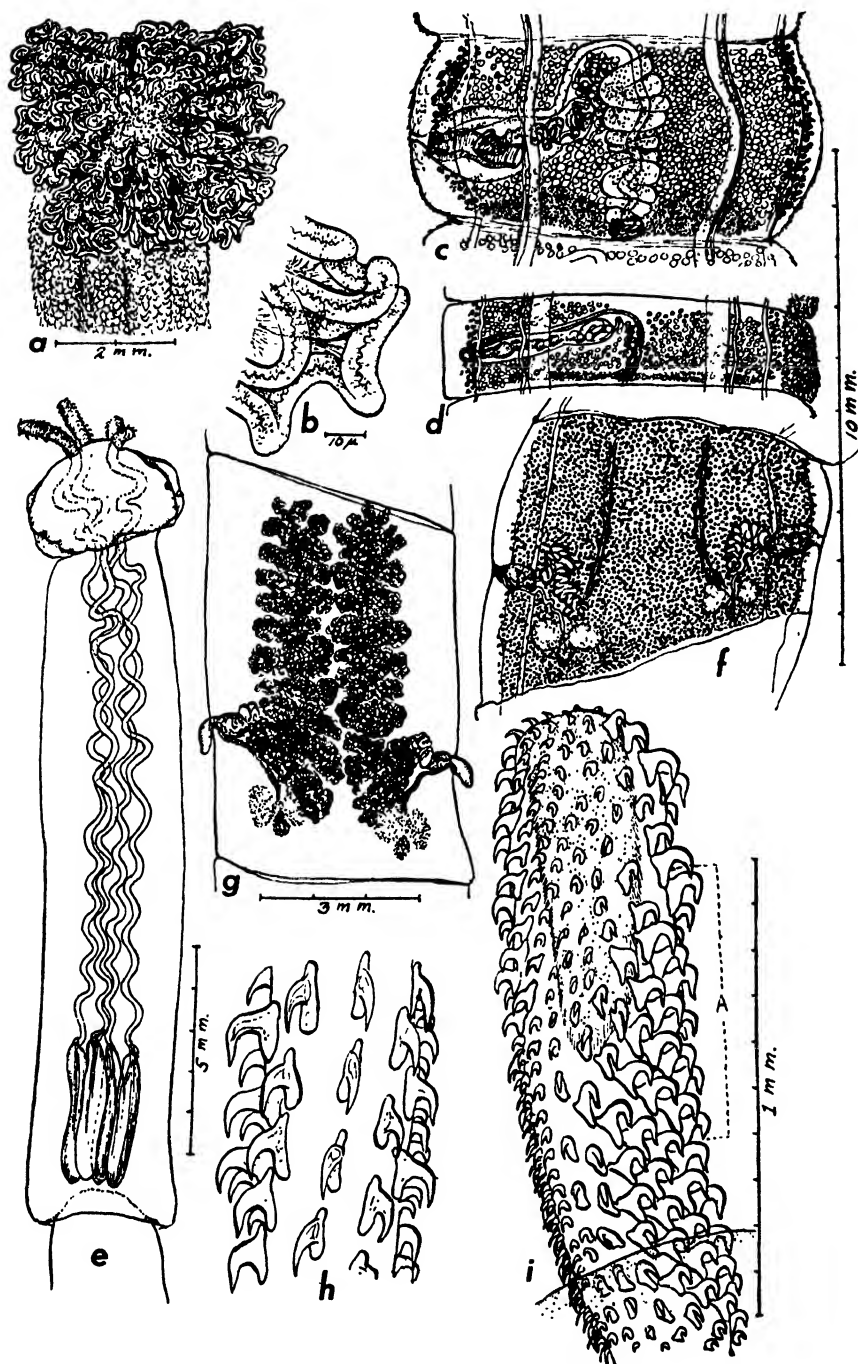


FIGURE 2.—(For explanation see opposite page.)

eventually appear as a series of pouches. The vitelline glands are very numerous at the sides, and probably cover the dorsal and ventral faces of the segments, though in the segments prepared for study they were peeled off to make the deeper-lying organs visible.

Host.—*Galeocерdo arcticus* (Faber).

Location.—Spiral valve.

Type specimen.—U.S.N.M. Helm. Coll. No. 36785.

Remarks.—Although strikingly similar to *Thysanocephalum thysanocephalum* (Linton, 1889), this species differs in general size and shape, proportions of segments, and particularly in the reticulations of the cuticle.

DIPLOÏTOBOTHRIUM, new genus

Generic diagnosis.—Bothria two, provided with ciliated pits laterally. Proboscides shorter than their sheaths, armed with diagonal rows of strong, recurved hooks, changing to small, irregularly arranged hooklets on inner side. Contractile bulbs elongate, the retractor muscles attached near their upper ends; strobila long, connected with scolex by unsegmented neck. Reproductive organs completely doubled.

Type.—*Diploïtobothrium springeri*, new species.

DIPLOÏTOBOTHRIUM SPRINGERI, new species

FIGURE 2, c-i

Specific description.—Scolex very broad and flat and very long (18 mm.). Bothria about 3 mm. long and 3.6 mm. broad. Width of head behind bothria 3.35 mm., nearly uniform for entire length. Proboscis sheaths in broad spirals, about five times as long as the bothria. Contractile bulbs about 3.5 mm. long and 0.47 mm. broad, the retractor muscles attached near the upper end. Proboscides about 2.5 mm. long and about 0.3 to 0.35 mm. broad exclusive of the hooks, 0.52 mm. broad including them. Hooks arranged in diagonal rows of 9 or 10 large, recurved, rose-thorn-shaped hooks, extending about two-thirds to three-fourths the distance around proboscis, the intervening area being occupied by small hooks more or less irregularly arranged; some of the small hooks near the base are only moderately curved and lack large bases. Largest hooks about 125 μ long, with a base of similar length; smallest hooks only about 20 μ long. Junction with strobila craspedote. Total length about 48 cm. Faint striations, indicating the beginning of segmentation, first visible about 4 mm. behind scolex. Mature segments, 20 to 30 cm. behind head, about 6 to 7 mm. broad and 3.75 to 4.75 mm. long. Terminal ripe segments about 5 to 6 mm. broad and 8 mm. long. Genital atria situated about middle of margin of segment in mature proglottids, posterior to middle in ripe ones. Paired ovaries and

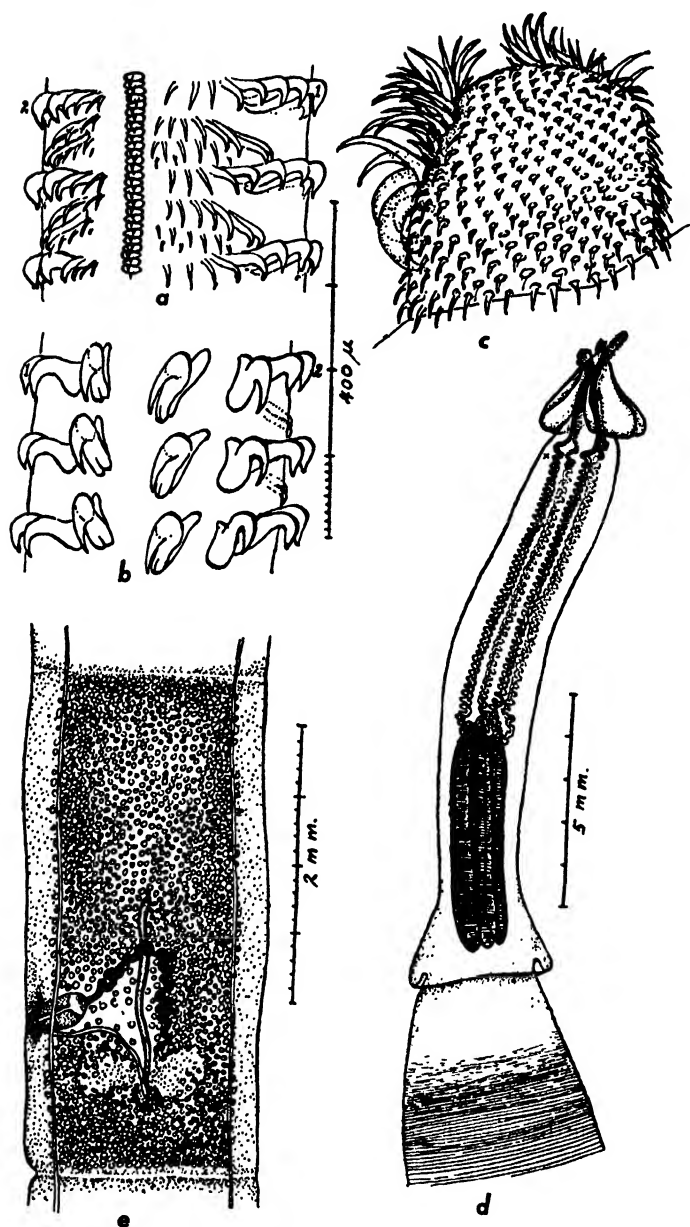


FIGURE 3.—*DASYRHYNCHUS INSIGNE* (Linton).

- a*, Portion of proboscis about 0.6 mm. from base; *b*, same, opposite side, hooks numbered 1 and 2 corresponding to similarly numbered hooks in fig. *a*; *c*, base of proboscis (remainder invaginated); *d*, scolex and anterior part of body ("X" indicates end of invaginated part of proboscis); *e*, mature segment 9 cm. from head, cuticle and layer of yolk glands stripped off.

Mehlis's gland grouped on each side, the complex about 1.4 to 1.5 mm. across, the midline of each about midway between margin of proglottid and median line of proglottid. Each ovary about 630μ to 700μ in diameter; Mehlis's gland about 500μ long and 350μ broad. Uterine stems in mature proglottids curve slightly inward; mature uteri barely touch at median line, and together occupy about three-fifths of width of segment. Cirrus sac about 1 mm. long and 560μ broad; everted cirrus 700μ long and 220μ broad. Eggs in the uterus are about 75μ long.

Host.—*Platysqualus tudes* (Cuvier).

Location.—Spiral valve.

Type specimen.—U.S.N.M. Helm. Coll. No. 36784.

Remarks.—The only other Tetrarhynchidea in which double sets of reproductive organs have been described are members of the genus *Dibothriorhynchus*, but the present worm certainly does not belong in that genus. Up to the present time all species of tetrarhynchideans having ciliated pits on the bothria have been placed in Linton's genus *Otobothrium*, but there is a very considerable variation in the proportions of the parts of the head and in the armature of the proboscides, and it may be that several genera will have to be recognized when the adults are known. *Otobothrium robustum* Chandler, 1935b, shows distinct affinity with the present species in the robust proportions of the head and in the armature of the proboscides, but it differs greatly in the distance between the bothria and the contractile bulbs and in the area on the proboscis occupied by small hooks. It is quite possible that *O. robustum* may prove to be a *Diplobothrium*, but it may best be left where it is until the adult is known.

Genus DASYRHYNCHUS Pintner

DASYRHYNCHUS INSIGNE (Linton, 1924)

FIGURE 3

A worm obtained from the spiral valve of *Carcharias platyodon* (Poey) is assigned to this species. It agrees very closely with Linton's description of the worm except that in his specimens segments situated 10 cm. from the head and having a developing uterus are broader than long, whereas in my specimen proglottids 9 cm. from the head are over twice as long as broad. The contractile bulbs are longer relative to the rest of the scolex in my specimen than in Linton's, but the coiling of the proboscis sheaths shows that the middle portion of the head is considerably contracted. There are certain features of the armature of the proboscis not evident from Linton's figures; these are shown in my fig. 3, *a-c*, in order to facilitate diagnosis in the future. The worm was recorded by Linton (1924) from *C. milberti* and *C. commersonii* at Woods Hole.

Genus NYBELINIA Poche

NYBELINIA PALLIATA (Linton, 1924)

This worm, designated *Tetrarhynchus palliatus* by Linton, was recorded by him from *Sphyrna zygaena* (Linnaeus) at Woods Hole. My specimen comes from the same host.

NOTES ON TETRARHYNCHIDEAN LARVAE

I wish to take this opportunity to reallocate, generically, certain tetrarhynchidean larvae described by me (1935a), on the basis of the classification of this group as worked out by Pintner, Dollfus, et al. The species that I referred to as *Gymnorhynchus gigas* and *G. malleus* should be known as *Pterobothrium filicolle* (Linton, 1889) and *P. malleum* (Linton, 1924), respectively, since Southwell (1930) was evidently in error in considering *P. filicolle* synonymous with *Gymnorhynchus gigas* (Cuvier, 1817). The species I described as *Tentacularia lepidia*, following Southwell's outmoded system, should be transferred to the genus *Callotetrarhynchus* Pinter, 1931, and be known as *Callotetrarhynchus lepidus*.

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A NEW SPECIES OF PHYLLOPOD CRUSTACEAN FROM THE SOUTHWESTERN SHORT-GRASS PRAIRIES

By J. G. MACKIN

AFTER several years of collecting streptocephalids in the Southern Plains regions of the United States, it has become apparent that some of the specimens do not conform with descriptions of *Streptocephalus texanus* Packard, to which species I have previously assigned all streptocephalids not having the peculiar spinous furcae of *S. seali*. I have in the past considered *S. texanus* rather variable. The study of a large number of specimens showed clearly that an undescribed species was present and that characters of all streptocephalids of our Plains region are quite constant. I am much indebted to my wife, Dorothy Louise Mackin, for the preparation of several hundreds of slides making possible the clear distinctions. I accordingly name the new species in her honor.

Technique.—Two techniques were followed in these studies. The first consists of staining specimens with acid fuchsin and dissecting and mounting as usual in Canada balsam. The other method is one worked out to aid in the study of comparatively large parts and organs of these phyllopods, such as the clasping antennae. Specimens are stained with acid fuchsin, with a few drops of hydrochloric acid added as usual, and then are run through the alcohols to benzene. A little Canada balsam is added to the benzene, and the specimens are then dissected. In dissecting for the clasping antennae, the head is cut off and then split along the sagittal plane, so that the two claspers are separated. The benzene is then allowed to evaporate slowly. If done gradually enough, distortion is eliminated. The balsam gives

the specimens a smooth, glossy coat. Both claspers are then stuck with glue or thick balsam on a clean slide, one showing internal view and the other external, and may be studied as opaque objects by direct lighting with an ordinary dissecting binocular. The detail to be seen by this method is considerably more than is possible with cleared mounts. The mounts can be made permanent if protected from dust by a cover glass supported on bits of cork or cork rings.

Genus *STREPTOCEPHALUS* Baird

STREPTOCEPHALUS DOROTHAË, new species

FIGURES 4, B; 5, B

*Description.*¹—The clasping antennae present definite characters that may be noted at a glance. The appendage is rather slender, and the first two segments are much wrinkled on the surface. The spinous processes in a row on the internal surface of the second segment are long and numerous, but this is not a reliable character. The third segment, or scissors, affords the best identification marks. The internal shorter branch bears two processes at the base on the anterior surface (fig. 4, B, at *f*). The shorter proximal one of these curves sharply inward (in fig. 4, B, toward the observer). The distal process is long and slender and curves around the body of the appendage and thus is partly hidden from internal view. (Compare these processes with the homologous structures in *S. texanus* shown in fig. 4, A, at *c*.) Toward the distal end of the inner branch of the scissors, shown at *d* in fig. 4, B, is a swollen area, the anterior surface of which is thin-walled and apt to be wrinkled. There is no process on the posterior side as in *S. texanus*. (Compare with fig. 4, A, at *a* of *S. texanus*.) One character of the external longer branch of the scissors is distinctive: The peculiar shape of the end of the posterior spur, which projects from near the base proximal to the "elbow" (fig. 4, B, at *e*). I have likened this shape of the end of the spur to a tiny foot, seen from side view, the rounded hump on the lower side being the "heel" and the point the "toe." (Compare the spur with that of *S. texanus*, fig. 4, A, at *b*, which is in the form of a smooth-pointed blade.) After comparing hundreds of specimens of *S. dorotheae* and *texanus*, I am convinced that these characters of the claspers are constant. One character of the swimming appendages may be of value: In *S. dorotheae* the bract is serrate over the entire outer margin. In *S. texanus* there are only a few small spines on this margin at the proximal end, and the remainder is smooth.

¹ In this diagnosis I have eliminated characters of generic and family rank. For instance, if there is nothing distinctive about the first antennae in peculiarities of shape, segmentation, etc., I see no necessity for noting the presence of the appendage, since it is present in all the Streptocephalidae. Thus I have omitted discussion of many characters usually mentioned in descriptions of streptocephalids, hoping to focus attention on those of most value. I do not find streptocephalids difficult to identify, and I am convinced that difficulties experienced by others are due to confusion of species by Packard and other earlier writers.

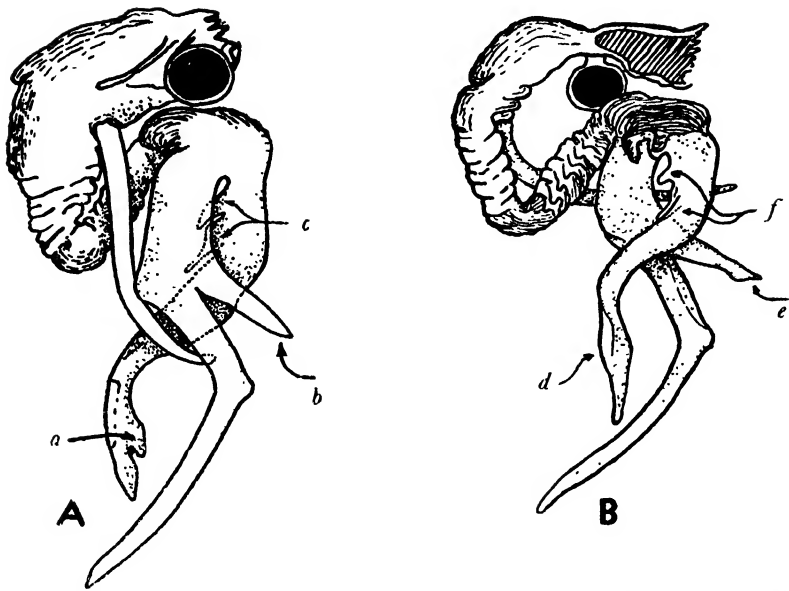
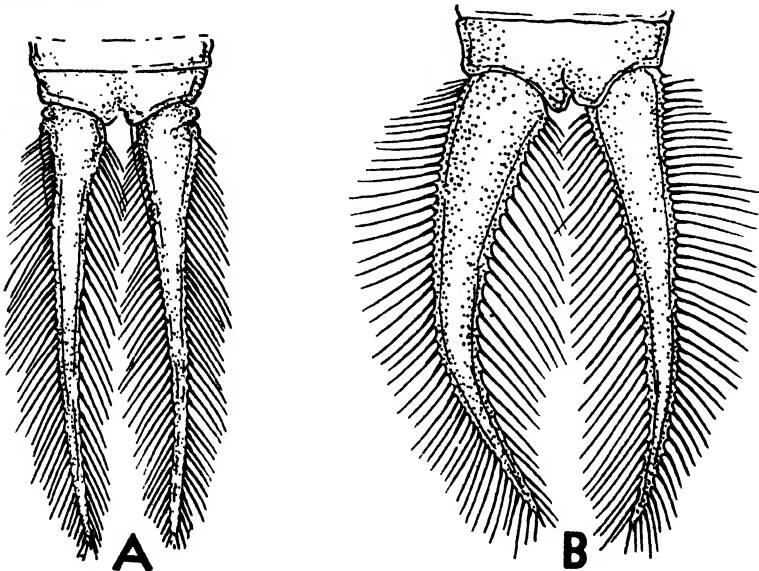


FIGURE 4.—A, *Stireptocephalus texanus*: Lateral view of second antennae (*a*, distal end of inner branch of scissors, showing posterior process; *b*, spur projecting from outer branch near the base proximal to the elbow, showing characteristic apex; *c*, the two processes at the base of the anterior surface of the internal shorter branch); B, *S. dorotheae*: Median view of male second antennae (*d*, distal end of inner branch of scissors, showing swollen area; *e*, spur projecting from outer branch near the base proximal to the elbow, showing characteristic apex; *f*, the two processes at the base of the anterior surface of the internal shorter branch).



The eggs of *S. dorotheae* are about the same size as those of *S. texanus*, but the wrinkled envelope seems to be much thicker and more coarsely folded. I am not sure how constant this character is.

The caudal furcae of the male are heavily setiferous to the end, contrasting with the spiny distal half in *S. seali* but not differing appreciably from the male furcae of *S. texanus*.

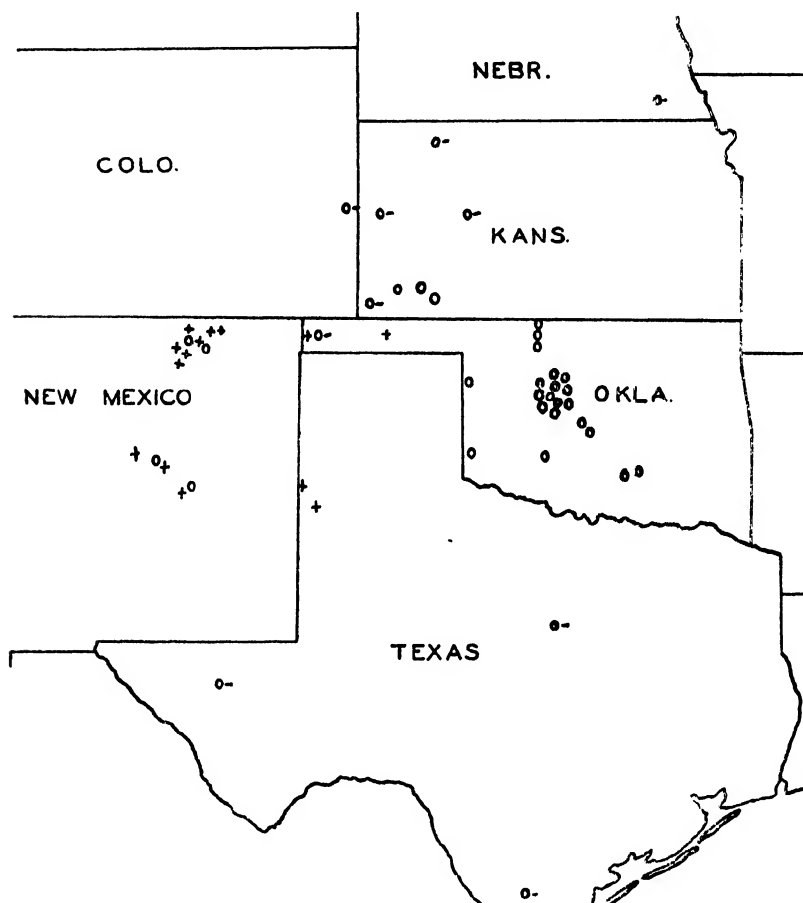


FIGURE 6.—Distribution of *Streptocephalus texanus* and *S. dorotheae*. Records of *S. texanus* given by Creaser in 1930 indicated by O— and those of the author by O. Records of *S. dorotheae* indicated by +. Three records of Creaser are not shown—one in California near the east border and two in southern Arizona.

Maximum-sized specimens are about 18 mm. in length, and some specimens not more than 10 mm. long are mature. The species seems comparatively smaller than *S. texanus*. I have one large male of the latter species, 29 mm. in length, taken in a large sink pond in New Mexico south of Santa Fe, and a number of specimens from a pond in

Pontotoc County, Okla., which attain a length of 23 mm. This is the same pond from which Creaser (1930) reported large specimens of *S. seali* (36.2 mm.).

Localities.—The following records are placed in approximate position on the map (fig. 6). There are 14 collections of *S. dorotheae*, all in New Mexico except 2 in the far western edge of the Texas Panhandle and 2 in the western end of the Oklahoma Panhandle. For comparison all records of *S. texanus* are also shown; 27 of these are collections and identifications by the author, and the previous records as shown by Creaser (1930) are added. The greatest concentrations of *S. dorotheae* are in the short-grass prairie, close to the Rocky Mountain foothills, while the most favorable ecological conditions for *S. texanus* seem to be farther east in the long-grass areas. All collections of *S. dorotheae* have been taken in August, but this means only that collecting trips are most feasible during that month, and I have not been able to make such trips at any other time. The date plus the additional number constitutes the author's accession number.

- 8-12-28+1, 8 miles west of Summerfield, Parmer County, Tex
- 8-18-36+3, 1 mile west of Turpin, Texas County, Okla.
- 8-18-36+4, 12 miles east of Boise City, Cimarron County, Okla.
- 8-19-36+6, 2 miles west of Capulin, Union County, N. Mex.
- 8-19-36+7, 10 miles west of Capulin, Colfax County, N. Mex.
- 8-19-36+8, 10 miles southeast of Raton, Colfax County, N. Mex.
- 8-19-36+10, 3 miles south of Raton, Colfax County, N. Mex.
- 8-20-36+11, 20 miles south of Santa Fe, Santa Fe County, N. Mex. (type locality).
- 8-20-36+12, 35 miles northwest of Encino, San Miguel County, N. Mex.
- 8-21-36+14, 12 miles northeast of Vaughn, Guadalupe County, N. Mex.
- 8-21-36+15, 100 meters east of New Mexico-Texas line, on Highway 66, Deaf Smith County, Tex.
- 8-27-38+3, 10 miles east of Raton, Colfax County, N. Mex.
- 8-27-38+1, 20 miles east of Colfax, Colfax County, N. Mex.
- 8-27-38+2, 5 miles southeast of Raton, Colfax County, N. Mex.

Remarks.—Not much is known concerning the ecology of the species of *Streptocephalus*. All North American species prefer clear water with abundant vegetation, and the largest populations occur in such habitats, although all three species are tolerant of high turbidities and limited food supply. All collections are from temporary ponds, or, in some cases, the large prairie "lakes" with widely fluctuating water level. I have on two occasions collected *S. dorotheae* and *S. texanus* in the same pond at the same time. Both of these were collections from near Raton, N. Mex. (8-19-36+8 and 8-27-38+3).

Characters of *S. texanus* have been shown in contrast with *S. dorotheae* in the text of the description and in figures 4 and 5. The species are undoubtedly closely related.

Cotypes.—In the collection of the U. S. National Museum (No. 79019) and in the collection of the author.

PACKARD'S DESCRIPTIONS OF STREPTOCEPHALUS TEXANUS

From a thorough study of the original and subsequent descriptions of *S. texanus* it becomes clear that Packard confused specimens of *S. seali* with his new species. The original description (1871) is vague, but the fact that he compared it with *S. similis* Baird, 1854, and stated its close kinship to this species shows that he must have had some specimens of *S. seali*. This is borne out by the fact that the figure 13 published with his short notice of *S. texanus* in 1874 is certainly a figure of *S. seali*. It is a rather crude drawing, but characters of the furcae and clasping antennae indicate *S. seali* rather clearly. In 1877 Packard described *S. watsoni*, using specimens from Ellis, Kans. (U. S. N. M. No. 58808). Subsequently he declared this species a synonym of *S. texanus* (1883) and repeated the description as a part of a redescription of *S. texanus*. Since this last description seems to be free from confusion with *S. seali* and is accompanied by good figures, our conception of *S. texanus* should be based on this one, and the original used for the sake of establishing priority alone. Incidentally, the cotypes of *S. watsoni*, in the absence of types of *S. texanus*, become the real basis for the latter species. Through the courtesy of the U. S. National Museum I have examined these specimens and thereby verified my own identifications.

KEY TO NORTH AMERICAN SPECIES OF STRETOCEPHALUS

(Modified from Creaser, 1930, to include *S. dorotheae*)

1. Male caudal furcae with setae along basal portion and heavy, curved spines distally..... 2
 Male caudal furcae setiferous along entire margin..... 3
2. Inner shorter branch of male clasping antennae with 2 processes on anterior margin near proximal end..... *seali* Ryder
 Inner shorter branch of male clasping antennae with 3 processes on anterior margin near proximal end..... *similis* Baird
3. Inner branch of male clasping antennae with a process on posterolateral margin near distal end; posterior spur of the longer outer branch blade-shaped.
 *texanus* Packard
 Inner branch of male clasping antennae without a process near distal end; posterior spur of the longer outer branch shaped like a miniature foot at the end..... *dorotheae*, new species

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DESCRIPTIONS OF FIVE NEW SPECIES OF CHALCIDOID-
DEA, WITH NOTES ON A FEW DESCRIBED SPECIES
(HYMENOPTERA)

By A. B. GAHAN

THIS paper contains descriptions of three new species of *Brachymeria* (one from Panama, one from Mexico, and one from Java), a new species of *Blepyrus* from Louisiana, and a new species of *Ooencyrtus* from Wyoming. All are described from reared material. The host record for the *Ooencyrtus* is especially interesting, since the species is parasitic in eggs of the Mormon cricket. Synonymical and distributional notes for a few described species also are included.

Family CHALCIDIDAE

Genus BRACHYMERIA Westwood

BRACHYMERIA JAMBOLANA, new species

Tumidicoxoides jambolana (Girault, MS.) RAMAKRISHNA AYYAR, Proc. 3d Ent. meeting Pusa, p. 323, 1919 (1920).

Tumidicoxoides n. sp. (Girault) RAMAKRISHNA AYYAR, Spolia Zeylanica, vol. 13, part 2, p. 254, 1925.

T. V. Ramakrishna Ayyar published the Girault manuscript name *Tumidicoxoides jambolana* without description, listing the species as a parasite of *Carea subtilis* at Coimbatore, India. Subsequently he republished the parasite record, this time listing the parasite as *Tumidicoxoides* n. sp. Girault. So far as known the name has never been validated. The specimens that formed the basis for the Girault manuscript name are in the United States National Museum and represent part of the material used for the present description. The genus *Tumidicoxoides* was reduced to synonymy with *Chalcis* by

Girault,¹ but *Chalcis* of authors (not Fabricius), as now recognized, is *Brachymeria* Westwood, and it is in that genus that the species belongs.

Female.—Length 4.25 mm. Very similar to *Brachymeria euploeae* Westwood but differing by being somewhat smaller, by the lateral ocelli being approximately their own diameter from the eye margins, by the flagellar joints, except the first, all being slightly broader than long, by lacking entirely the tubercle on the inner ventral margin of the hind coxa, and by having the fore and middle tibiae immaculate yellow. Also very similar to *albotibialis* Ashmead from which it differs by having the tooth nearest the base of posterior femur smaller or at least no larger than some of the other teeth, by having the punctures on mesoscutum and scutellum more narrowly separated, by having the pits on hypopygium somewhat smaller and more numerous, by having the flagellar joints very slightly shorter, and by having the blackish band at base of posterior tibia shorter, this band usually embracing only about one-sixth the length of tibia.

Postorbital branch of the genal carina present and well developed; punctures of thoracic dorsum coarse and contiguous; apex of scutellum with the plate weakly emarginate medially; propodeum coarsely, irregularly rugose; abdomen subacute, ovate; first dorsal segment of gaster smooth and nearly bare dorsally but with the dorsolateral angles conspicuously hairy; following segments weakly shagreened with one or more conspicuous rows of hairs extending clear across the dorsum, the penultimate segment with moderately strong pits in addition to the shagreening; hind femur with rather weak, fine punctures, more or less shining, its ventral margin with 10 to 12 blunt teeth, the 3 teeth nearest base usually shorter than the others; postmarginal vein fully twice as long as stigmal vein.

Black; flagellum dark brown or black; palpi, tegulae, apical half of anterior femur, apical one-third of median femur, a large spot at apex of hind femur, anterior and median tibiae entirely, and all tarsi yellow; hind tibia yellow, with a narrow black or blackish band at extreme base and the carina along the margin black. Wings hyaline; marginal and stigmal veins dark. Hairs clothing the body grayish white and densest on front of head.

Male.—Unknown.

Type locality.—Coimbatore, India.

Type.—U.S.N.M. No. 20898.

Remarks.—The type and two paratypes, according to the labeling, were reared at Coimbatore, India, June 1, 1916, from a moth infesting "Jambolana." Since these specimens are the original Girault manuscript types, they are undoubtedly the specimens upon which Ayyar's

record, cited in the synonymy, was based. According to this note the host was *Carea subtilis* (Walker) infesting *Eugenia jambolana*. Two additional paratypes from Coimbatore are labeled "Par. on *Danaïs*, 14-II, 1913, Ponniah coll." Six paratypes are from Buitenzorg, Java, reared in March 1932 from pupae of *Papilio agamemnon* Linnaeus, and six others from the same locality were reared from a lepidopterous pupa on *Ficus ampelas*, April 1, 1935, by Dr. Muller. Four paratypes (two of which were returned to the sender) were received in 1939 from C. J. H. Franssen, of the Institute for Plant Diseases, Buitenzorg, Java, reared in June 1936 from *Papilio agamemnon* by R. Awibowo. Five additional paratypes from Padang, Sumatra, were reared from *P. agamemnon* and received in 1918 from S. Leefmans.

BRACHYMERIA DISCRETA, new species

This species differs from all the previously described species of *Brachymeria* known to me by having on the dorsum of the scutellum a conspicuous, smooth, impunctate area that is slightly elevated and rounded posteriorly and terminates rather abruptly a little behind the middle of the scutellum. The species superficially resembles *B. fonscolombei* Dufour but may be distinguished by the longer and slenderer antenna, by the much shorter teeth on the hind femur, by the broadly arcuate emargination of the second segment of the gaster, by the conspicuous smooth area on the scutellum, and by the somewhat differently colored legs.

Female.—Length 4.75 mm. Antennae inserted on a line with lower extremities of eyes; scape rather long; flagellum moderately slender, nearly the same thickness throughout most of its length, the two apical joints of club tapered to a blunt point; first funicular joint about twice as long as broad, second and third funicular joints a little longer than broad, fourth to seventh joints quadrate or nearly so; club very slightly longer than the two preceding joints. Ocellular line distinctly a little more than half the longest diameter of a lateral ocellus. Head rugosely sculptured, the rugosity somewhat coarser laterad of the upper half of scrobe than elsewhere; post-orbital branch of genal carina present and complete; malar space less than half the eye height. Thorax punctate, the punctures on prescutum distinctly larger than those on scapulae; punctures on scutellum similar to those on posterior part of prescutum; carinate plate at apex of scutellum narrow and not emarginate; propodeum irregularly rugose, without well defined carinately bounded areas except adjacent to the spiracles; mesopleuron with femoral depression strongly transversely striated. Forewing with postmarginal vein about one-fourth as long as marginal; stigmal vein completely sessile and hardly half as long as postmarginal. Posterior femur nearly twice as long as broad, its outer surface closely punctate, its ventral

margin with about 9 or 10 unusually short, blunt, subequal teeth and with a slight tubercle on inner ventral margin. Abdomen pointed-ovate, about as long as head and thorax; first tergite perfectly smooth and bare except for a few hairs on dorsolateral margins, posterior margin straight; second tergite hairy and weakly shagreened dorsolaterally, polished and bare on middle of dorsum and on ventral half of lateral aspect, its posterior margin not straight but broadly arcuately emarginate medially; sides of third, fourth, and fifth tergites entirely sculptured and hairy, their dorsums more weakly sculptured and each with one more or less complete transverse row of hairs; posterior margin of third tergite very slightly, arcuately emarginate medially, that of fourth and fifth not emarginate; sixth tergite completely hairy and finely shagreened and with numerous shallow, indistinct punctures or pits; seventh tergite about as long as sixth, finely shagreened and hairy; ovipositor sheath barely extending beyond apex of seventh tergite.

General color black; scape reddish testaceous beneath, black or blackish above; pedicel and flagellum black; tegulae yellow; wings hyaline, venation dark brown; anterior and middle coxae black, posterior pair black outwardly but usually testaceous on inner side; femora varying from brownish testaceous to mostly black, with a pale-yellow spot at apex of each; tibiae likewise varying from brownish testaceous to black, the anterior and middle pairs yellowish at bases and apices and the posterior pair with a yellow spot on posterior face of each some distance behind the base and another at extreme apex; tarsi testaceous; abdominal sternites more or less testaceous.

Male.—Length 3.3 mm. Agreeing with the description of female except that the raised area on scutellum is less conspicuous, being smaller and not polished but very finely sculptured, the abdomen is about as long as thorax, the second tergite is not distinctly arcuately emarginate, the hind coxae are entirely black, and the sternites are black. The antennal flagella are missing from the only male specimen available; the scape is like that of the female.

Type locality.—Tamazunchale, San Luis Potosi, Mexico.

Type.—U.S.N.M. No. 55149.

Remarks.—Described from six females and one male received from Phil Rau under his note Nos. 1431 and 1436 and said to have been reared from nests of *Polistes instabilis* Saussure collected in the type locality, the parasites having emerged at Kirkwood, Mo., May 7 to 14, 1939.

BRACHYMERIA DISCRETOIDEA, new species

This is very similar to *discreta* but, so far as may be judged by the material at hand, seems to be sufficiently distinct to justify description as a different species.

Female and male.—Both sexes differ from *discreta* in the following particulars: The ocellocular line is less than half as long as the longest diameter of a lateral ocellus. The vertex is a little less strongly sculptured and when viewed from directly above seems to have a low but distinct ridge originating at the dorsal margin of the median ocellus and running laterad in front of each lateral ocellus nearly to the eye margin, where it curves downward along the inner orbit. (No such ridge is apparent in *discreta*.) The slightly elevated area is present on the scutellum but in this species is very finely sculptured. The femoral depression on the mesopleuron is not transversely striated but smooth. The propodeum is divided by coarse carinae or rugae into about 25 more or less distinct areas, the median one of which is ovate or elliptical in shape and extends from the base to the apex of the propodeum, while the others are irregular in shape and roughly arranged in series of three between the base and the apex of the propodeum. The stigmal vein is not completely sessile but very shortly petiolate. The color is very similar to that of *discreta*.

Anterior coxae black, middle pair almost entirely, and posterior pair beneath reddish testaceous; trochanters testaceous; anterior and middle femora blackish with their apices pale yellowish; hind femur mostly black with the base broadly testaceous and a large pale-yellow spot at apex; anterior and middle tibiae yellow at bases and apices, dark testaceous to blackish in the middle; posterior tibia black at extreme base, with a large yellow spot near base and another at apex, the rest reddish testaceous; tarsi testaceous; forewings very faintly tinged with fuscous; abdomen of female reddish beneath, of male entirely black. In all other respects agreeing with description of *discreta*.

Type locality.—Frijoles, Panama Canal Zone.

Type.—U.S.N.M. No. 55150.

Remarks.—Described from 15 females and 13 males reared in December 1923 by Wheeler and Zetek under Zetek No. 2352 from a nest of *Trigona amalthæa* (Olivier), which was infested by an unidentified moth.

Family PTEROMALIDAE

Genus DIBRACHYS Foerster

DIBRACHYS CAVUS (Walker)

Pteromalus cavus WALKER, Ent. Mag., vol. 2, p. 477, 1835.

Dibrachys cavus (Walker) KURDJUMOV, Rev. Russe Ent., vol. 13, p. 11, 1913.—

GAHAN, Proc. Ent. Soc. Washington, vol. 30, p. 211, 1938.

Trichomalus truffilloti BLANCHARD, Rev. Chilean Hist. Nat., vol. 41, p. 178, 1937 (1938). (New synonymy.)

To the already long list of synonyms of this widely distributed species, as set forth by Kurdjumov in 1913 and amplified by Gahan in

1938, apparently should be added *Trichomalus trujilloi* Blanchard. Blanchard described *trujilloi* as a parasite of the oriental fruit moth in Uruguay.

H. L. Parker recently sent to the Bureau of Entomology and Plant Quarantine specimens that he stated were bred from this moth at Montevideo, Uruguay, by Mesa Carrion, and that had been identified as *Trichomalus trujilloi* by Blanchard. Parker recognized the Uruguayan parasite as probably *Dibrachys cavus* and requested that they be compared with material of that species in Washington. So far as I can see these specimens do not differ in any respect from *Dibrachys cavus*, and since they also agree perfectly with the description of *Trichomalus trujilloi* I have no hesitation in declaring the latter name a synonym.

Genus HYPsicAMARA Foerster

HYPsicAMARA LACHNI (Ashmead), new combination

Pachycrepis lachni ASHMEAD, Trans. Amer. Ent. Soc., vol. 14, p. 193, 1887.

The types of *Pachycrepis lachni* Ashmead, which are in the United States National Museum collection, do not have complete parapsidal grooves and therefore do not belong in the genus *Pachycrepis*. The parapsidal grooves are present only on the anterior one-half of the mesonotum. In this respect, as well as in all other generic characters, this species seems to agree with *Hypsicamara* Foerster as represented by *H. ratzeburgi*, the genotype, of which I have seen specimens in the Naturhistorisches Museum in Vienna, Austria, identified by Gustav Mayr.

Hypsicamara is very similar to *Pachyneuron* Walker, differing only by having a slightly longer and slenderer marginal vein, which, although distinctly thickened, is nearly uniform in width throughout its whole length, and by having the abdomen in both sexes sub-cylindrical and distinctly narrower than the thorax. The genus may have to be synonymized with *Pachyneuron* eventually.

Ashmead's types of *Hypsicamara lachni* were reared from a pine aphid (*Lachnus australis* Ashmead) at Jacksonville, Fla.

I have recently identified as *H. lachni* the following material received from Clyde F. Smith, of Ohio State University, and reared by him in connection with an investigation of the parasites of various aphids: 3 specimens reared from aphids on *Pinus virginiana* collected in Hocking County, Ohio, June 26, 1938; 19 specimens from aphids on *Salix*, Columbus, Ohio, June 19 and July 7, 1938; 5 specimens from an unidentified host collected at Mink Creek, Idaho, July 18, 1937; and 6 specimens taken at Beaver Creek, Utah, July 25, 1937. Still more recently 6 specimens of what appears to be the same species were received through O. Peck, reared July 1, 1932, from aphids on *Abies balsamea*, taken at Fredericton, New Brunswick, Canada, by R. E. Balch.

Family APHELINIDAE

Genus ABLERUS Howard

ABLERUS PERSPECIOSUS Girault

Ablerus perspeciosus GIRAULT, Ann. Ent. Soc. Amer., vol. 9, p. 292, 1916.

Azotus silvestrii COMPERE, Univ. California Publ. Ent., vol. 4, p. 9, 1926. (New synonymy.)

The types of *Ablerus perspeciosus* Girault and *Azotus silvestrii* Compere in the United States National Museum collection have been compared and found to agree completely. *A. perspeciosus* was described from specimens reared from *Diaspis pentagona* Targioni taken at Nishigahara, Japan, and *A. silvestrii* from specimens supposedly reared from *Chrysomphalus aonidum* (Linnaeus) taken at Shanghai, China.

Two specimens, determined by Girault as *Ablerus perspiciosus*, are in the United States National Museum collection, reared from *Diaspis pentagona* at Washington, D. C., in October 1913 by R. A. Cushman. One specimen, also now in the National Museum collection, was recently received from W. J. Schoene, of the Virginia Agricultural Experimental Station at Blacksburg, Va., who stated that it had been reared from *D. pentagona* but did not indicate the exact locality where the scale was taken.

Family ENCYRTIDAE

Genus BLEPYRUS Howard

BLEPYRUS SACCHARICOLA, new species

This species differs from typical *Blepyrus* in some respects. The frons is distinctly narrower than in *B. insularis* (Cameron), the ocellar triangle is acute, and the sculpture of the mesoscutum and scutellum is distinctly finer and more granulose. In other respects the female differs only slightly from *insularis*. The antenna of the male, however, is quite unlike that described for *insularis* by Timberlake.² According to Timberlake the funicle in the male of *insularis* has only three joints and the club is very greatly enlarged and solid. In the present species the male antenna has six distinct funicular joints and a club that is only slightly thicker than the last funicular joint, subcylindrical, obliquely truncate at apex, and distinctly 3-jointed. The male antenna somewhat resembles that in *Zarhopalus*, but the venation is different, and the scape of the female is not distinctly expanded. The species is also similar to *Euryrhopalus* in many respects but differs in the shape of the head, in the longer marginal vein, and in the antenna of the male.

² Proc. Hawaiian Ent. Soc., vol. 5, p. 171, 1922.

Female.—Length 2 mm. Head menisciform, as wide as thorax; frons narrow, the frontovertex approximately four times as long as broad, narrowest at front ocellus, expanding slightly below this point, and sharply expanded above the lateral ocelli; ocellar triangle acute; anterior ocellus about its own diameter from eye margins; lateral ocelli less than their own diameter from eyes; eyes large and conspicuously hairy; surface of frons with small, close, shallow punctures none of which are distinctly umbilicate; face and cheeks very finely reticulate-punctate, the sculpture somewhat finer than that of frons; scrobes subtriangular, not deep; malar space equal to approximately one-third eye height; head, in lateral view, moderately thin, rounded in front, frons not prominent.

Antennae inserted at clypeus; scape subcylindrical, very slightly broadened medially, not nearly reaching to front ocellus; pedicel a little more than twice as long as broad; funicle six-jointed, all the joints transverse, and successively increasing in width from first to last; club very large, fully as long as funicle and distinctly much wider than the last funicle joint, oval, rounded at apex, and distinctly 3-jointed. Thorax short and broad, only a little longer than broad; pronotum strongly transverse, opaquely sculptured; mesoscutum fully twice as broad as long, very finely and densely reticulate punctate, subopaque, and clothed with short brownish hairs; scutellum flat, subtriangular, very finely and evenly punctate, the surface completely mat and clothed with short dark-colored hairs; axillae touching on median line and sculptured like scutellum; pleura finely lineolate, slightly shining; propodeum short, nearly smooth but with faint reticulation. Forewing reaching well beyond apex of abdomen, nearly two and one-half times as long as broad, evenly ciliated basad of fenestra as well as elsewhere on disk; marginal vein about three times as long as thick, stigmal nearly twice as long as marginal, postmarginal distinctly longer than stigmal; hind wing reaching about to apex of abdomen, and about half as broad as forewing. Legs rather long; median tibiae a little longer and thicker than posterior tibiae; spur of median tibia about three-fourths as long as basal joint of tarsus; median tarsus moderately thick, tapering slightly toward apex, the under side of first segment hairy but without distinct spines. Abdomen broadly sessile, about as long and as broad as thorax, subtriangular, rounded at apex, weakly reticulated, somewhat shining; cerci located a little before the middle; ovipositor concealed.

General color deep black; mesoscutum dull metallic green; scape, anterior and median tibiae apically, posterior femora apically, posterior tibiae entirely, and all tarsi reddish testaceous; wings hyaline, venation brownish testaceous; flagellum black.

Male.—Length 1.6 mm. Antennal scape somewhat fuscous; flagellum clavate but not strongly so; pedicel about twice as long as broad;

funicle six-jointed, the joints all wider than long, successively increasing slightly in width and length, the sixth joint not quite twice as wide as first and about twice as broad as long; club not quite so long as funicle, scarcely broader than last funicle joint, subcylindrical, obliquely truncate at apex, and very indistinctly 3-jointed. Posterior femora entirely and their tibiae for the most part blackish. Otherwise like the female.

Type locality.—Franklin, La.

Type.—U.S.N.M. No. 55151.

Remarks.—Female holotype and three female paratypes received from J. W. Ingram and said to have been reared from *Pseudococcus* sp. on sugarcane taken at Franklin, La. Allotype male reared from the same host at Thibodeaux, La., October 28, 1928, by E. K. Bynum, and one paratype female reared by the same entomologist from similar material collected at Gainesville, Fla.

Genus EURYRHOPALUS Howard

Euryrhopalus HOWARD, Proc. U. S. Nat. Mus., vol. 21, p. 237, 1898.

Synaspidia TIMBERLAKE, Proc. Hawaiian Ent. Soc., vol. 5, p. 397, 1924. (New synonymy.)

The type of *Euryrhopalus schwarzi* Howard (genotype of *Euryrhopalus*) and paratypes of *Synaspidia pretiosa* Timberlake (genotype of *Synaspidia*) have been compared and found to agree in all generic characters. The two species are extremely similar but may be distinguished, for the present at least, by the fact that *schwarzi* is slightly the larger, with the forewing distinctly infumated behind the marginal vein, the hind wing distinctly more than half as broad as the forewing and forming a broad but distinctly acute angle at its apex, while the forewing of *pretiosa* is without distinct infuscation and the hind wing is not more than half the width of the forewing with its apex more rounded. Otherwise they seem to be practically indistinguishable.

Genus OOENCYRTUS Ashmead

OOENCYRTUS ANABRIVORUS, new species

The female of this species is usually, though not always, brachypterous. The fully winged female appears to be a nearly typical *Ooencyrtus* except that the scutellum is less strongly sculptured, less convex, and less rounded at apex, while the forewing is weakly infuscated medially and the abdomen is a little longer and more robust than usual. The brachypterous females have the scutellum nearly flat, very faintly sculptured, and subacute posteriorly, while the wings vary in length and correspondingly in width, in some specimens barely extending to the apex of the propodeum, but in others attaining the middle of the abdomen. In the majority of individuals the

forewings extend to or a little beyond the apex of the first tergite. The males apparently are always fully winged but differ from typical *Ooencyrtus* by having the funicle of the antenna slightly compressed, the joints subequal, about as broad as long, narrower at base than at apex and clothed with relatively short hairs, none of which is longer than the segments. These differences do not seem sufficient to justify the erection of a new genus for the species, the habits of which agree with those of other species of *Ooencyrtus*.

Fully winged female.—Length 1.6 mm. Head as wide as thorax, with fine, reticulate sculpture; eyes rather large, very sparsely pilose; ocelli small, forming a nearly right-angle triangle; ocellular line slightly longer than diameter of lateral ocellus; width of frons equal to approximately one-third width of head; frontovertex about one and one-third times as long as broad; scrobes moderately impressed, rounded above; cheeks rounded; malar groove distinct but fine; mandibles each with three short subequal teeth; maxillary palpus four-jointed, labial palpus 3-jointed; antennae inserted near anterior margin of face; scape compressed, about four times as long as broad, broadest medially; pedicel subcylindrical, nearly three times as long as broad, about equal in length to first and second funicular segments combined; funicular joints cylindrical or nearly so, the first joint just a little longer than broad and slightly narrower than pedicel; second joint subequal to first; third to sixth joints about as long as broad, the sixth slightly thicker than the first; club cylindrical, not thicker than funicle, about as long as three preceding funicular joints combined and distinctly 3-jointed. Thorax slightly compressed dorsoventrally; mesoscutum distinctly broader than long, weakly convex, weakly reticulated and with numerous small, shallow hair punctures; scutellum low, nearly flat, subtriangular, subacute at apex, a little longer than mesoscutum and with similar reticulate sculpture, but with sparser and less distinct hair punctures; whole dorsum of thorax somewhat shining; propodeum short, weakly reticulately sculptured, without distinct carinae; pleura more strongly sculptured and less shining than mesoscutum. Legs normal, spur of middle tibia about two-thirds as long as first tarsal joint. Forewing extending beyond apex of abdomen, a little more than twice as long as broad; marginal vein a little longer than broad, postmarginal longer than marginal but a little shorter than stigmal, which is about twice as long as marginal; marginal cilia short; discal cilia rather dense and short; oblique hairless streak behind stigmal vein wider posteriorly than anteriorly and complete. Abdomen as long as head and thorax combined, as broad as or a little broader than thorax, rather robust, ovate, weakly reticulately sculptured; ovipositor not exerted. Black, somewhat shining; antennae entirely black; all coxae, anterior and posterior

femora, and posterior tibiae at base black, or blackish; middle femora more or less testaceous mixed with blackish; rest of legs testaceous; forewing weakly infuscated from base to a little beyond middle, hyaline apically; hind wing hyaline.

Brachypterous female.—Like the fully winged female except for the short wings and the fact that the scutellum is even more flattened and more nearly acute posteriorly.

Male.—Length 1.2 mm. Apparently always with fully developed wings, the forewing without infuscation; antennal scape about like that of female; pedicel not much longer than broad and only slightly longer than first funicular joint, pale at apex; funicular joints pale at base, dark at apex, the first funicular joint slightly smaller than the others, all slightly compressed and about as long as broad at apex; club not broader than funicle and about as long as the two preceding joints combined; trochanters, knees, apices of all tibiae, and all tarsi testaceous. Otherwise agreeing with description of female.

Type locality.—Big Horn Mountains, Wyo.

Type.—U.S.N.M. No. 55148.

Remarks.—Described from 71 specimens, all reared in December 1939 from eggs of the Mormon cricket, *Anabrus simplex* Haldeman, collected in the Big Horn Mountains, Wyo., by J. R. Parker and H. J. Schipmen, and consisting of 1 fully winged female (the holotype), 64 brachypterous females, and 6 males (one allotype).



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A NEW STOMATOPOD CRUSTACEAN FROM THE WEST COAST OF MEXICO

By STEVE A. GLASSELL

THROUGH the kindness of Capt. Fred E. Lewis, of Balboa, Calif., I received an interesting stomatopod that he collected on a recent expedition to the west coast of Mexico in his yacht, the *M. S. Stranger*. This crustacean proved to be a new and unusual member of the genus *Squilla*. In order to call attention to the peculiar eyes of this new species, I have named it *Squilla oculinova*:

Order STOMATOPODA: Family SQUILLIDAE

Genus *SQUILLA* Fabricius, 1787

SQUILLA OCULINOVA, new species

FIGURE 7

Holotype.—Female, U. S. N. M. No. 79380, from Santiago Bay, near the port of Manzanillo, state of Colima, Mexico, 10–13 fathoms; March 24, 1939; collected by Capt. Fred E. Lewis.

Diagnosis.—No median carina on carapace or rostrum. Raptorial dactylus with four teeth, including the terminal one. No mandibular palp. Epipodites on first three thoracic limbs only, accessory branches of last three pairs of thoracic legs 1-jointed. On the abdominal segments intermediate, lateral, and marginal carinae are discernible; on fifth and sixth the intermediates are more plainly marked than on proximal somites; the sixth somite is the only one with submedian carinae. Cornea emarginate, with a scalloped an-

terior border. Antennules and antennae bearing rami and geniculate spines. Antennal acicle cordate, nearly twice as long as wide. Telson with median and submedian carinae only.

Description.—Anterior width of carapace slightly more than half the length, exclusive of rostrum. Anterolateral angles not spined. Rostrum wider than high, without carina. Carapace smooth and shining, with only a suggestion of a median carina. The cervical groove does not cross the median area, although it does interrupt the gastric groove.

The cornea are subtransversely placed on their stalks; the inner margin of the stalk is shorter than the outer; on the median line the stalks and cornea are equal in length to the width of the rostrum, as is also that portion of the stalk proximal to the cornea. The distal margin of cornea is emarginate, with a median U-shaped groove, from which on either side it rises to a rounded crest, thence into a saddle or depression, and finally to a blunt rounded peak. The effect on looking at this scalloped edge from above is that the margin is beaded, owing to the protruding facets of the cornea; it does not form a distinct line when viewed from the front.

The antennules are armed with geniculate spines and rami. The antennae possess rami at their distal ends. The antennal acicle is cordate, with a heavy median longitudinal vein; in the proximal half it is wider than half its length.

There is no mandibular palp.

The outer inferior angle of the merus of the raptorial leg is rounded; the carpus has a groove and keel above, the latter entire and terminating distally in a rounded-off right angle; the propodus is armed with the usual three spines and series of pectinations; the dactylus is armed with four teeth including the terminal one; the outer margin of the dactylus is angled posteriorly and notched just before the angulation. In all respects the raptorial leg is subsimilar to that of *S. swetti* Schmitt.¹

The free thoracic somites are smooth and have carinae on the last three somites in line with the intermediates of the abdomen other than the marginals; the fifth somite has a pair of curved carinae, one on its proximal, the other on its distal anterolateral margins, almost meeting on the median line, that of the distal margin terminating in a forward-pointing spine, that of the proximal ending in a small ventral spine beneath the other; lateral margins of the sixth and seventh somites rather truncate, with rounded angles. Epipodites on the first three thoracic limbs only, accessory branches of the last three pairs of legs 1-jointed.

¹ Allan Hancock Pacific Expeds., vol. 5, No. 4, p. 146, fig. 3, 1940.

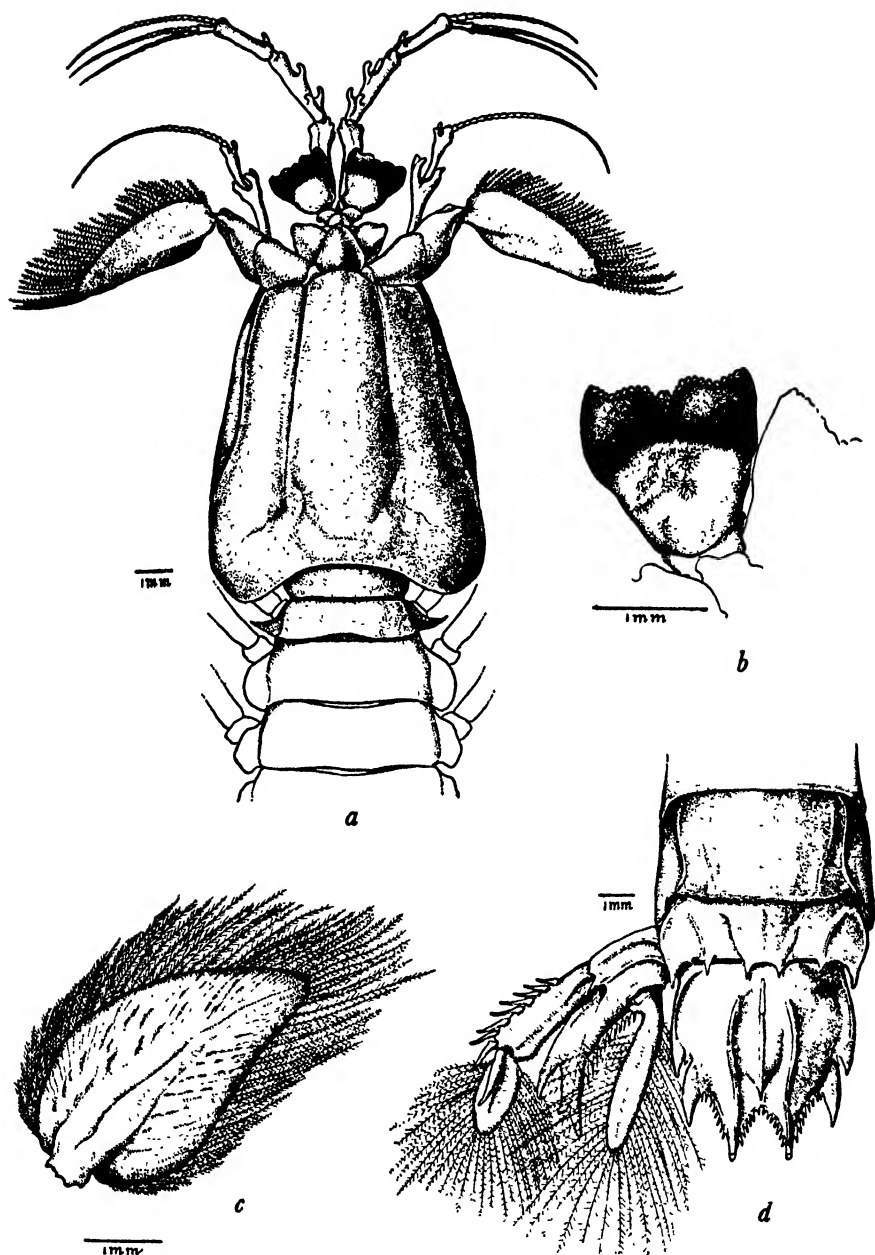


FIGURE 7.—*Squilla oculinova*, new species; female holotype: *a*, Anterior portion of animal; *b*, eye; *c*, antennal acicle; *d*, telson and left uropod.

On the abdominal somites intermediate, lateral, and marginal carinae are discernible; on the fifth and sixth the intermediates are more plainly marked than on the preceding somites; the sixth somite is the only one with submedian carinae; the carinae of this somite are all spined.

The telson is wider than long; the median carina has two spines, the proximal one the smaller, the distal one much larger, the carina ending at the median V; the submedian carinae extend from near the base of the telson onto the dorsal surface of the submedian teeth. These with the exception of the marginal are the only carinae on the telson, the surface of which is otherwise slightly punctate and shining. The denticles number 7, 8-9, 1. The bifurcate process of the uropods bears 10-12 spines on its inner margin; the inner of the two projections is about twice the length of the outer; it carries a large rounded-tipped tooth on its outer margin. The submedian spines of the telson have movable tips.

Color in alcohol.—Cream, with brown chromatophores more closely grouped on distal median margins of all thoracic and abdominal somites.

Measurements.—Body length overall, exclusive of rostrum, 35.6; carapace length 8.1, anterior width 4.5; rostral length 1, width 1.5; length of telson 4, width 5.5. All measurements in millimeters.

Material examined.—Known only from the type specimen.

Remarks.—This small stomatopod shows some divergences from the norm as exhibited in part by Hansen's *S. ambigua* and *S. incerta*.² These consist in the main of the shape of the cornea, the spined antennules, and the enlarged antennular acicle, characters that in *S. oculinova* are somewhat unique for the genus. In Schmitt's key in the Hancock report (*op. cit.*, p. 140) it would fall near his *S. swetti*, the major differences being as above stated.

² *Siboga Expedition, Stomatopoda*, monogr. 35, pp. 6, 8, 1926.

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THE CHRYSOMELID BEETLES *LUPERODES BIVITTATUS* (LECONTE) AND *VARICORNIS* (LECONTE) AND SOME ALLIED SPECIES

By DORIS H. BLAKE

Most of the vittate and yellow-brown species of *Luperodes* Motschulsky from the United States are at present listed under the names *L. bivittatus* (LeConte) and *L. varicornis* (LeConte), respectively. There are at least five vittate species, all very similar in markings, confused with *bivittatus*, and I have found 11 of the yellow-brown species that in one collection or another have been labeled *varicornis*. Both vittate and yellow-brown species are small and inconspicuous and not particularly noteworthy, with the exception of *L. brunneus* (Crotch), which Horn synonymized with *varicornis*. *L. brunneus* is a well-known pest throughout the South on corn and cotton.

There is considerable question whether some of the species should not be removed from the genus *Luperodes*. They have certain characteristics in common with the species of that genus having black or metallic coloration, but in general are not closely related. Schaeffer has described one species, actually synonymous with *varicornis* (LeConte), as belonging to the genus *Monolepta*, mainly because of its closed anterior coxal cavities. Some of the others discussed here have closed anterior coxal cavities and are related to species from Mexico and Central America described by Jacoby and also assigned to the genus *Monolepta*.

- | | | |
|---|-------------------------------------|----|
| 8. Elytra entirely black..... | flavoniger , new species | 9 |
| Elytra pale yellow or brownish, sometimes with dark sutural, lateral, or marginal shadings..... | | |
| 9. Elytra entirely pale, without dark sutural, lateral, or marginal shadings..... | | 10 |
| Elytra brown or pale yellow, with sutural, lateral, or marginal dark edges or shadings..... | | 16 |
| 10. First tarsal joint of hind leg not so long as remainder together, aedeagus short and relatively broad..... | | 11 |
| First tarsal joint of hind leg approximately equal to or longer than rest together, aedeagus long and relatively narrow..... | | 13 |
| 11. Antennae in male much enlarged..... | crassicornis Fall | 12 |
| Antennae in male not much enlarged..... | | |
| 12. Elytra very polished, head brownish..... | curvatus Fall | |
| Elytra not polished, head pale..... | vandykei , new species | |
| 13. Antennae uniformly dark, without paler basal joints..... | popenoei , new species | |
| Antennae with the basal joints paler than rest..... | | 14 |
| 14. Narrowly oblong, aedeagus spoon-shaped. New Mexico. | | |
| | elachistus , new species | |
| Oblong oval, aedeagus not spoon-shaped, with a narrow tip..... | | 15 |
| 15. Aedeagus with tip long, narrowly compressed, and, when viewed from side, irregularly curved. Texas..... | pallidulus , new species | |
| Aedeagus very narrow its entire length and when viewed from side somewhat arcuate but not much curved..... | brunneus , pale form | |
| 16. Elytra rugose, semicostate. Lower California..... | rugipennis , new species | |
| Elytra not costate or rugose. United States..... | | 17 |
| 17. Brownish..... | brunneus (Crotch) | |
| Yellow, with brown shadings or edges..... | | 18 |
| 18. Narrowly oblong, very tiny (3 mm.). Chiricahua Mountains, Ariz..... | chiricahuensis , new species | |
| Ovate..... | | 19 |
| 19. Very conspicuously and densely punctate..... | punctatissimus , new species | |
| Punctate but not very conspicuously so..... | | 20 |
| 20. Interocular space less than half width of head, eyes large, Baboquivari Mountains and vicinity, Ariz..... | ocularis , new species | |
| Interocular space half or more than half width of head..... | | 21 |
| 21. Aedeagus very narrow most of its length when viewed from above; elytra with suture more or less darkened and often with a median brownish area sometimes extending across it. | | |
| | varicornis (LeConte) | |
| Aedeagus broader, narrowed only toward tip; elytra pale without dark shadings, only sutural and marginal edges dark..... | | 22 |
| 22. Aedeagus 2-parted at tip..... | brunneus , pale form | |
| Aedeagus not 2-parted at tip..... | convexus , new species | |

LUPERODES BIVITTATUS (LeConte)

PLATE 6, FIGURES 14, 15

Phyllobrotica bivittata LECONTE, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 81.
Luperus bivittatus LECONTE, Proc. Acad. Nat. Sci. Philadelphia, 1865, p. 209.
Luperodes bivittatus HORN, Trans. Amer. Ent. Soc., vol. 20, p. 110, 1893.

LeConte's type of *bivittatus* in the LeConte collection at Cambridge is labeled Fort Tejon and is probably the only specimen that he had

when he described the species. Following it are five other specimens, all females, with the label "Cal." and a male with the label "Cala." The type specimen, a male, is pale yellow, with a narrow sutural and moderately wide lateral vitta extending from the base over the humerus but not reaching the apex. The head is polished, impunctate, rounded, a deeper yellow than the prothorax, with the mouthparts having darker tips. The interocular space is more than half the width of the head. The antennae are pale, not extending to the middle of the elytra, the fourth joint nearly twice as long as the third. The prothorax is widest before the middle, is a third wider than long with a faint suggestion of spotting, and is polished and nearly impunctate. The scutellum is pale. The dark elytral vittae are joined about the base with a narrow dark line. The elytra are not very distinctly punctate. The body beneath is pale, the breast slightly deeper yellow-brown in coloring. The anterior coxal cavities are open.

A series of specimens in the Van Dyke collection at the California Academy of Sciences, collected at Potwisha, Sequoia National Park, Calif., altitude 2,000-3,000 feet, corresponds entirely with the LeConte type. I have examined a great many other specimens from localities in general nearer the coast and from farther north in California that present wider dark elytral vittae, a dark scutellum, and usually entirely dark undersurface. These specimens have been taken at Auburn (Placer County), Carrville (Trinity County, altitude 2,400-2,500 feet), Chico (Butte County), Davis (San Joaquin County), Fairfax (Marin County), Grass Valley (Nevada County), Lake City (Modoc County), Los Gatos (Santa Clara County), Moraga Valley (Contra Costa County), Morgan Hill (Santa Clara County), Napa County, Paraiso Springs (Monterey County), Santa Cruz Mountains (Santa Clara County), Santa Rosa, Walnut Creek (Contra Costa County), Vinehall (Contra Costa County). In all these the aedeagi appear to be very much the same. The darker and more northern and coastal specimens may be simply a color form.

There are also specimens from Graniteville (Nevada County), Cayton (Shasta County), and Eldorado County, all inland and from mountainous localities, that are somewhat intermediate, being paler in coloring, particularly of the undersurface, but not quite so pale as the type. In these, too, the aedeagus is indistinguishable from that of the specimens corresponding to the LeConte type.

LUPERODES DIEGENSIS, new species

PLATE 6, FIGURE 16

About 4-5.5 mm. in length, elongate oblong, shining pale yellowish with narrow dark elytral vittae at suture and from the humerus nearly to the apex, body beneath dark, last four or five antennal joints tending to be slightly paler than basal ones.

Head polished, deeper reddish yellow in coloring, smoothly rounded over the occiput, frontal tubercles well defined, interocular space very wide, over half the width of the head. Antennae extending nearly to the middle of the elytra, third joint shorter than fourth, in color varying from pale to reddish brown, but in darker specimens the four or five apical joints becoming paler than the basal ones. Prothorax about a third wider than long, somewhat convex, with rounded sides, shining, finely alutaceous, usually deeper reddish yellow than elytra. Scutellum usually dark. Elytra oblong, somewhat convex, elytral humeri not prominent, only faint trace of intrahumeral depression, finely punctate; pale yellow with sutural edges piceous nearly to apex, and a narrow lateral vitta extending over the humerus nearly to the apex. Body beneath usually dark with pale pubescence, legs pale, all tibiae spurred, first tarsal joint of hind leg barely as long as the remainder together. Anterior coxal cavities open. Length 4.2–5.8 mm., width 1.9–2.5 mm.

Type, male, and 6 paratypes (5 female, 1 male), U.S.N.M. No. 55110.

Type locality.—San Diego, Calif., collected January 1, 1909, by Ricksecker on the flowers of *Adenostoma*.

Other localities.—Piñon Flat, San Jacinto Mountains, collected by E. S. Ross; in the mountains near Claremont, collected by C. F. Baker.

Remarks.—This species, confused in collections with *L. bivittatus* (LeConte), seems to occur only in southern California. It is more convex than *bivittatus*, and the aedeagus is different.

LUPERODES MONORHABDUS, new species

PLATE 6, FIGURE 22

About 4.5 mm. in length, elongate oblong, moderately shining, yellow-brown, with reddish-brown antennae and usually a median spot or vitta on the pronotum, and on the elytra a sutural and a lateral vitta, the body beneath tending to be dark.

Head polished, pale, with the tips of the mouth parts slightly deeper in coloring, rounded and polished over the occiput, tubercles well defined, with a transverse depression above, interocular space over half the width of the head. Antennae reaching scarcely to the middle of the elytra, third joint not so long as fourth, all joints deep reddish brown or darker. Prothorax somewhat convex with rounded sides, scarcely a third wider than long, polished, very finely punctate, deep yellow or reddish and usually with a dark median vitta, but this sometimes lacking. Scutellum dark. Elytra oblong, somewhat convex, with moderately prominent humeri and short intrahumeral depression, shining, very finely punctate; pale, a dark sutural vitta not reaching the apex, and a lateral one extending over the humerus and about the scutellum to join the sutural one. Body beneath dark, shining, with a

pale pubescence; anterior coxal cavities open. Legs pale, each tibia spurred, first hind tarsal joint not so long as the rest together. Length 4.2–4.9 mm., width 1.8–2 mm.

Type, male, and 2 paratypes (female), U.S.N.M. No. 55111.

Type locality.—Los Angeles, Calif., collected by Coquillett.

Remarks.—The uniform color of the dark antennae, in which neither basal nor apical joints are paler, and the dark vitta that is usually present on the pronotum differentiate this species from the other vittate ones. Two specimens in the Los Angeles Museum are labeled Los Angeles County, collected by M. Albright, and "Cal.," respectively.

LUPERODES TUBERCULATUS, new species

PLATE 6, FIGURE 19

About 4 mm. in length, oblong oval, faintly shining, yellow-brown, with narrow sutural and lateral piceous vittae on the elytra. In male a pair of tubercles in the middle of the abdomen.

Head shining, pale yellow-brown, smoothly rounded over the occiput, a transverse line above the tubercles extending from eye to eye, interocular space over half the width of the head; a slight protuberance between the antennal bases. Antennae entirely pale, extending to the middle of the elytra, second and third joints about equal, fourth not so long as second and third together. Prothorax about a fourth wider than long, with arcuate sides, not very convex, surface shining, very finely punctate, entirely pale. Scutellum pale. Elytra oblong, smoothly rounded with small humeral prominences, shining very finely punctate; pale yellow-brown, with the sutural edges piceous almost to the apex, and a narrow lateral vitta extending over the humerus nearly to the apex, these two joined by a dark edge about the base and scutellum. Body beneath entirely pale. In male a pair of tubercles in the middle of the abdomen. Anterior coxal cavities open, hind tibiae spurred (others not visible). First hind tarsal joint not quite so long as the remaining ones together. Length 4–4.5 mm.; width 1.8–2 mm.

Type, male, and 3 paratypes (2 male, 1 female), the type and 1 male paratype in collection of the Los Angeles Museum, 2 paratypes in National Museum collection, U.S.N.M. No. 55112.

Type locality.—Camp Baldy, at the foot of Old Baldy Mount, San Antonio Mountains in San Bernardino County, Calif., collected June 17, 1916, by L. L. Muchmore.

Remarks.—The outstanding peculiarity of this species is the presence of a pair of well-developed tubercles on the abdomen of the male. I have not seen these on any other American beetle, although they are known to occur in such genera of the Galerucinae as *Phyllobrotica* and *Hoplasoma* in Europe and Asia.

LUPERODES MELANOLOMATUS, new species

PLATE 6, FIGURE 17

About 5–6 mm. in length, oblong, somewhat shining, pale, with very narrow dark sutural and lateral elytral stripe and with the edge of the elytra from below the humerus or in apical half darkened; breast, sometimes abdomen, and usually tibiae and tarsi and sometimes half of femora dark.

Head pale, smooth, rounded over the occiput, tubercles defined, interocular space more than half the width of the head. Antennae dark with first three basal joints pale, extending below the middle of the elytra, third joint half as long as the fourth. Prothorax about a fourth wider than long, widest anteriorly and narrowed toward the base; disk not very convex, faintly shining, very finely alutaceous, entirely pale. Scutellum reddish or piceous. Elytra oblong, not very convex, somewhat shining, very finely alutaceous and finely punctate; a dark reddish-brown or piceous sutural vitta, sometimes narrowing so that only the edges of the suture are dark, and a narrow lateral vitta extending over the humerus and base and connecting with the sutural vitta about the scutellum, the lateral vitta not reaching the apex of the elytron, but the sutural vitta usually extending to the apex and joining there with a dark marginal edge which extends to the epipleura and runs along the margin from below the humerus or sometimes from about halfway down the elytron. Body beneath in pale specimens pale with reddish-brown breast, but in darker specimens both breast and abdomen often darkened. Legs usually pale at base, often femora entirely pale, but usually the femora dark at the apex, tibiae and tarsi dark. First tarsal joint of hind leg nearly as long as the remainder together. All tibiae spurred. Length 5–6.5 mm.; width 1.8–2.2 mm.

Type, male, and 4 paratypes (2 male, 2 female), the type and 2 paratypes (1 male, 1 female) in collection of the California Academy of Sciences; 2 paratypes (1 male, 1 female) in National Museum collection, U.S.N.M. No. 55113.

Type locality.—Piñon Flat, San Jacinto Mountains, Calif., collected by E. G. Linsley and E. S. Ross, May 24 and 25, 1939.

Other localities.—Santa Rosa Park, Riverside County, Calif., collected June 22, 1940, in the Van Dyke collection; El Toro, Orange County, collected by C. Dammers, May 17, 1938.

Remarks.—There are also two old specimens in the National Museum collection labeled simply "Cal." and "S. Cal." Apparently this species is confined to southern California. It is not closely related to *L. bivittatus* (LeConte) although vittate. It belongs to an entirely different group, being allied to *L. californicus* Schaeffer and having a similarly shaped prothorax and long antennae.

LUPERODES NEBRODES, new species**PLATE 6, FIGURE 21**

About 5-6.5 mm. in length, oblong, shining, pale yellow-brown, with piceous antennae, except the three basal joints, piceous sutural and lateral edges, and piceous breast and often abdomen.

Head polished, pale reddish yellow, with piceous edges of mouth-parts, rounded over the occiput, frontal tubercles slightly produced with a groove running obliquely up toward margin of eye on each side; interocular space more than half the width of the head. Antennae extending to the middle of the elytra, stout, fourth joint nearly twice as long as third, three basal joints pale, remainder piceous. Prothorax about a third wider than long, widest anteriorly, narrowing gradually to base, not very convex, pale reddish yellow, somewhat shiny, finely alutaceous. Scutellum piceous. Elytra oblong with small humeral prominences and short intrahumeral sulcus; very finely alutaceous and finely punctate, feebly shining, pale yellow-brown, with sutural edges usually dark in basal half and occasionally widened to form a dark sutural vitta not reaching the apex; lateral edges in basal part darkened sometimes. Body beneath in males with breast and abdomen dark piceous, in the three females examined the breast piceous and abdomen pale. Legs pale with tarsal joints edged with dark piceous, sometimes hind tibiae becoming dark at apex. Front coxal cavities open, all legs spurred, first tarsal joint of hind legs not so long as the rest together. Length 5.2-6.9 mm.; width 2.3-2.5 mm.

Type, male, and 10 paratypes (7 male, 3 female), U.S.N.M. No. 55114.

Type locality.—Downings Ranch, Terrell County, Tex., May 10, 1912, collected by J. D. Mitchell.

Remarks.—In general coloring this species somewhat resembles *L. californicus* Schaeffer, but it is paler and has a quite differently shaped and broader prothorax. It belongs to that group of larger species having the prothorax wider anteriorly, to which *L. californicus* belongs. In the three females the coloring of the abdomen is pale; in the males it is piceous.

LUPERODES FLAVONIGER, new species**PLATE 6, FIGURE 18**

About 6 mm. long, slender, narrowly oblong, somewhat shining, entirely black except for the reddish-yellow head and three basal antennal joints, sometimes coxae and apices of joints of anterior legs deep reddish brown.

Head smooth, shining, reddish yellow, with the tips of the mouth-parts darker. Interocular space over half width of head. Antennae

extending beyond the middle of the elytra, third joint about half as long as fourth, three basal joints pale. Prothorax widest anteriorly where a little wider than long, then narrowing to base; disk not very convex, somewhat shining, finely alutaceous, entirely black. Scutellum dark. Elytra elongate oblong, not very convex, with small prominent humeri and a long intrahumeral depression, entirely black, somewhat shiny, alutaceous, and finely punctate. Body beneath entirely dark except for paler coxal joints, the pale pubescence thicker on the breast. Legs dark, apices of joints somewhat paler, all tibiae spurred, first tarsal joint of hind leg as long as the rest together. Front coxal cavities open. Length 6.2 mm.; width 2.2 mm.

Type, male, 1 paratype, female, U.S.N.M. No. 55115.

Type locality.—El Toro, Orange County, Calif., collected May 17, 1938, by C. Dammers.

Remarks.—*Luperodes semiflavus* Fall is the only other species having dark or metallic elytra and a pale head, but the prothorax, legs, and body beneath of *semiflavus* are also pale. *L. flavoniger* appears to be closely related to *L. californicus*, having a similarly shaped prothorax.

LUPERODES VARICORNIS (LeConte)

PLATE 5, FIGURE 4

Luperus varicornis LECONTE, Trans. Amer. Ent. Soc., vol. 2, p. 57, 1868.

Luperodes varicornis HORN, Trans. Amer. Ent. Soc., vol. 20, p. 110, 111, 1873.

Monolepta crucigera SCHAEFFER, Bull. Brooklyn Inst., vol. 2, p. 249, 1906.

Luperodes marginalis FALL, Trans. Amer. Ent. Soc., vol. 36, p. 149, 1910.

The type of *Luperus varicornis* in the LeConte collection at Cambridge, a female labeled "Ariz.," is 3 mm. long and 1.8 mm. wide. The head is pale yellow, with a reddish-brown streak down the median line of the occiput; the mandibles are red-brown; there is a transverse line across the vertex and above the tubercles, and the tubercles are distinctly marked but not prominent; the occiput is finely punctate. The interocular space is about half the width of the head. The antennae are longer than half the body, pale at base, the first three joints entirely so, the fourth and remainder with darkened apical half, the second and third are nearly equal to the fourth, the rest about equal to the fourth. The prothorax is not twice so wide as long, slightly rounded at the sides, shining, very finely punctate, and pale yellow, with red-brown lateral markings along the margin and sides. The scutellum is reddish. The elytra are oval, a little wider behind the middle, shining, faintly and finely punctate, the punctation a little more distinct and less dense than on pronotum, the margin and suture reddish brown, widening at the suture to an

indefinitely defined area near the middle and also along the sides and at apex. Below, the breast is reddish brown, the abdomen a little lighter, the legs pale, abdomen lightly pubescent and punctate, the first tarsal joint of the hind leg longer than the rest, a tiny spur on the tibiae.

LeConte stated in his description that he had only one specimen and that from Arizona. Besides the type there are other specimens in his collection from Texas and Kansas, none of which is the same species as the type, and since they were undoubtedly added later, they are not of consequence in this discussion.

Schaeffer described *Monolepta crucigera* from a series of specimens taken in the Huachuca Mountains, Ariz. Apparently he did not consider at all the possibility that the species might belong in the genus *Luperodes* or might have been previously described. He placed it in the Monoleptides chiefly on account of the closed anterior coxal cavities. As he writes, the dark marking on the elytra is very variable; "in some specimens the elytra may be more properly called black with a large basal and an elongate apical spot pale." The dark sutural spot may widen in the middle of the elytra so as to extend to the lateral margin, thus forming a cross, or, again in Schaeffer's series of specimens, the elytra may appear nearly pale with only a dark sutural and lateral edge. Specimens similar to LeConte's type also occur in his series.

In his description of *Luperodes marginalis* from Alpine, Tex., Fall states that the species agrees very closely with *varicornis*, but that according to LeConte's description, *varicornis* is entirely yellow, while his own specimens had more or less of piceous markings. At the time Fall was not able to consult the LeConte collection and knew *varicornis* only from its short description, in which, it is true, no mention is made of the brownish area about the suture. In the Fall collection at Cambridge, the specimen bearing Fall's type label, a female, very similar to LeConte's type specimen, also bears the label *Monolepta crucigera*, in Fall's handwriting. Two others from Alpine, Tex., are placed in a row following two of Schaeffer's labeled in Schaeffer's handwriting *M. crucigera*. It would appear that Fall had discovered that his *marginalis* was the same as Schaeffer's earlier described species, but apparently he had never compared it with LeConte's type of *varicornis*, although he had earlier noted its strong resemblance to *varicornis*.

Among Fall's material from Alpine, Tex., both in his own collection and in some he gave to Bowditch, are some entirely pale specimens that he mentioned as immature in his description of *L. marginalis*. These are really a different species and are discussed farther on in this paper.

L. varicornis is abundantly represented in the National Museum collection by specimens collected by Nunenmacher and others at Nogales, Ariz. In a recent collection at Nogales, they were stated to be found on almond leaves and fruit. They were collected by Morrison in Arizona, and in Schaeffer's collection, besides the types from the Huachuca Mountains, there are specimens from Palmerlee, Cochise County, Ariz. Wickham collected it at Alpine, Tex., and specimens are in the California Academy of Sciences from the Chisos Mountains, Brewster County, Tex. One specimen only has appeared from New Mexico, and that was collected by F. H. Snow and is in the University of Kansas collection.

LUPERODES BRUNNEUS (Crotch)

PLATE 5, FIGURE 5

Luperus brunneus CROTCH, Proc. Acad. Nat. Sci. Philadelphia, 1873, p. 44.

Luperodes varicornis HORN, Trans. Amer. Ent. Soc., vol. 20, p. 111, in part, 1893.

Luperodes davisi LENG, Journ. New York Ent. Soc., vol. 19, p. 193, 194, 1911.

Crotch's type of *L. brunneus* may very well be a specimen in the LeConte collection bearing the label "N. C.," as Crotch stated that his specimen was from North Carolina. It is a shining brown beetle, with the head, prothorax, and legs a little paler yellow-brown and the antennae with the apices of each joint from the fourth to the apical joint dark, and is the species that is so abundant a pest throughout the South on corn, okra, and cotton.

I have not examined Leng's type of *L. davisi*, described from Georgia, but according to H. S. Barber, who has seen the type, it is the same as Crotch's species.

Since Horn's revision of the Galerucini, *L. brunneus* has been synonymized with *varicornis*. LeConte described *varicornis* from Arizona, while Crotch's species came from North Carolina. In coloration and markings the typical forms are not alike, and the aedeagi, while similar, are quite distinct. There is a pale-yellow form of *brunneus* similar in coloring to the very palest forms of *varicornis*, which is represented in the National Museum collection by specimens from Georgia (Savannah, near Townsend, and Harrison), and Kansas (Manhattan, Topeka, and Riley County). Although the aedeagi of these pale-yellow forms appear from without to be like those of the typical dark brown forms, one aedeagus, unfortunately lost, had the internal sac inflated to some extent, and this was peculiar in having a series of rather long spines projecting from it. The internal sac of the typical *brunneus* showed shorter spines. Whether this constitutes a specific difference I do not know. One of the specimens of the pale form from Kansas bore the note that it was found injuring dahlias, hollyhocks, and cornsilk, and those from Georgia

were collected on cotton. Thus the food habits appear to be pretty much the same in both pale and dark forms.

Specimens of typical *brunneus* are in the National Museum collection from North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Oklahoma, and Kansas. There are two specimens labeled New York, and a series labeled Rockport, Mass., but in both cases I doubt the authenticity of the locality label.

LUPERODES RUGIPENNIS, new species

PLATE 5, FIGURE 10

About 4 mm. in length, elongate oblong, pale yellow-brown, with reddish-brown occiput and a dark sutural, basal, and in part lateral edge on elytra, not shining, the surface of the pronotum and elytra uneven, the elytra showing traces of costation.

Head deeper in color over the occiput and alutaceous; interocular space about half the width of the head. Antennae extending beyond the middle of the elytra, with pale basal joints, second and third joints together not quite so long as fourth. Prothorax a third wider than long, with sides nearly straight; surface uneven with a depression on each side and down the middle, finely and obsoletely punctate, entirely pale yellow. Elytra with more conspicuous punctation than prothorax and with traces of irregular, poorly defined costae, the surface appearing rugose; humeri not at all prominent; entirely pale except for the sutural, basal, and lateral edges, the last usually being dark only in basal half. Body beneath entirely pale. All tibiae spurred, first hind tarsal joint a little longer than the others together. Anterior coxal cavities open. Length 3.5–4.5 mm.; width 1.5–1.9 mm.

Type, male, and 16 paratypes (5 male, 11 female), U.S.N.M. No. 55116.

Type locality.—Las Parras, Baja California, collected by W. M. Mann, October 1923.

Other localities.—Purrisima, Palmarita, San José del Cabo, Baja California.

Remarks.—The uneven, distinctly punctate surface of this species and its semicostate elytra make it easily distinguishable.

LUPERODES PALLIDULUS, new species

PLATE 5, FIGURE 12

About 3–4 mm. in length, oblong oval, very finely punctate, shining, pale yellow, occiput, sometimes lateral edge of prothorax, breast, and femora deeper in color, the antennae usually deep brown except the basal joints and the base of each joint.

Head with smoothly rounded occiput, very finely punctate, tubercles well defined, with transverse groove above running from eye to eye; interocular space half width of head, occiput deeper yellow in coloring.

Antennae extending fully halfway down elytra, second and third joints together scarcely as long as fourth, remainder a little shorter than fourth and approximately equal, three basal joints pale, the rest usually dark brown except at base. Prothorax about a third wider than long, with slightly arcuate sides, smooth, shining, very finely punctate. Scutellum pale. Elytra broadly oblong oval, not depressed, humeri marked with a short intrahumeral depression, very finely and obsoletely punctate, entirely pale. Body beneath finely pubescent, pale, sometimes breast and femora a little darker. All tibiae with spines, first tarsal joint of hind legs considerably longer than the rest together. Anterior coxal cavities closed. Length 3.2–4.3 mm.; width 1.8–2.2 mm.

Type, male, and 14 paratypes (6 male, 8 female), U.S.N.M. No. 55117.

Type locality.—Fort Sam Houston, Tex.; collected by H. H. Bishopp on rose, April 24, 1940.

Other localities.—Victoria, collected by R. A. Cushman on *Opuntia* and cotton, by C. M. Walker on cotton, and by W. E. Hinds on anemone; San Antonio (E. V. Walter), Columbus (E. A. Schwarz), Lavaca (Schwarz), Cuero (Cushman), North Braunfels (W. D. Pierce), Dallas (W. D. Pierce on *Callirrhoe involucrata*); all in Texas.

Remarks.—One of the specimens of Fall's *L. marginalis* from Alpine, Tex. (collected July 20, 1922, 4,400–6,000 feet, by Wickham), is a male of this species. It is very likely the specimen mentioned in his description of *L. marginalis* as immature and paler. But the other specimens of this species in his collection were identified as *L. varicornis* LeConte.

It is a longer, more convex, and paler insect than *varicornis*. There is no trace of dark coloring on the pronotum or elytra, although the lateral edges of the pronotum are occasionally darker. The shape of the aedeagus, with its long, irregularly curved tip, is strikingly different from that of any of the related species.

LUPERODES ELACHISTUS, new species

PLATE 5, FIGURE 9

About 3 mm. in length, oblong, slender, shining yellow-brown, with the occiput and all but the first three joints of the antennae and the body beneath reddish brown; head, pronotum, and elytra finely punctate.

Head with interocular space over half its width, occiput smoothly rounded and polished, with very fine, scattered punctures; tubercles well defined, with a marked depression above them. Antennae extending below the middle of the elytra, fourth joint twice as long as third and slightly longer than following, which are about equal, first

three pale yellow, remainder reddish brown. Prothorax about a fourth wider than long with sides nearly straight, shiny, finely and rather closely punctate. Elytra not much wider than prothorax, without depressions, humeri not prominent, shining, finely punctate. Body beneath reddish brown with legs a little paler. Anterior coxal cavities open. First hind tarsal joint as long as the rest together. Length 3-3.2 mm.; width 1.2-1.3 mm.

Type, male, and one paratype, U.S.N.M. No. 55118.

Type locality.—Las Vegas, N. Mex., collected September 8 by E. A. Schwarz and H. S. Barber.

Remarks.—This is one of the tiniest of the yellow-brown species and is distinguished from *varicornis* by its narrowly oblong shape. It has a peculiar spoon-shaped aedeagus.

LUPERODES POPENOEL, new species

PLATE 5, FIGURE 7

About 3.5 mm. in length, elongate oblong oval, finely and rather closely punctate, pale yellow, with reddish-brown occiput and entirely reddish-brown antennae; legs and body beneath often deeper brown.

Head frequently with deep reddish occiput, pale below except for the darker mandibles; finely punctate and alutaceous, tubercles separated from occiput by a deep groove, front little produced, interocular space fully half the width of the head. Antennae extending down to the middle of the elytra, fourth joint about equal to second and third together, rest a little shorter and nearly equal in length; entirely deep reddish brown. Prothorax about one and one-fourth times as broad as long, with sides only slightly arcuate, surface shining, densely and finely punctate; pale yellow, sometimes with a trace of spots. Elytra elongate, smooth, not so convex as in *brunneus*, humeri not prominent; surface shining, finely and densely punctate. Body beneath finely pubescent, breast frequently darker, tibiae of all legs with spines, hind tarsal joint about equal to the rest together. Anterior coxal cavities open. Length 3.5-4 mm.; width 1.8-2 mm.

Type, male, U.S.N.M. No. 55119.

Type locality.—Kansas.

Other localities.—Texas (Belfrage collection), Kansas (collected by F. H. Snow, E. A. Popenoe, and in the collection of C. V. Riley).

Remarks.—In this species there is no suggestion of darker markings on the pronotum or elytra, and all the joints of the antennae are of a uniform color, deep reddish or piceous without any paler basal joints. It is more oblong and less convex than is *varicornis*. In the Popenoe collection from western Kansas is one beetle labeled "*Luperus n. sp. Lec.*," which very probably was examined by LeConte himself and so determined.

LUPERODES CHIRICAHUENSIS, new species

PLATE 5, FIGURE 8

About 3 mm. in length, slender elongate oblong, pale yellow, with dark margin on prothorax, surface distinctly and densely punctate.

Head pale with a dark median streak down the occiput, interocular space a little more than half the width of the head, occiput alutaceous and distinctly punctate, a groove above tubercles not deep but well defined, extending from eye to eye. Antennae yellow-brown, gradually deepening in color toward the apical joints; extending at least to the middle of the elytra; second and third joints together about equal to fourth, remainder subequal. Prothorax about a third wider than long, sides nearly straight, surface shining and distinctly punctate, much more so than in the Baboquivari species, *L. ocularis*. Elytra more rugosely punctate than *varicornis*, a few short scattered hairs on apical half of elytra. Body beneath finely pubescent, breast and tip of abdomen a little deeper brown. Tibiae of all legs spurred, first hind tarsal joint longer than remainder together. Anterior coxal cavities closed. Length 2.6–3.3 mm.; width 1.1–1.4 mm.

Type, male, and 1 paratype, female, the type in the California Academy of Sciences, the paratype in the National Museum collection, U.S.N.M. No. 55120.

Type locality.—Texas Canyon, Chiricahua Mountains, Cochise County, Ariz., 5,000–6,000 feet, Sept. 13, 1927, collected by J. A. Kusche, in the Van Dyke collection, California Academy of Sciences.

Remarks.—This species is distinguished by its slender, oblong shape, the distinct punctation, and the fine hairs near the apex of the elytra. The aedeagus is finely pointed.

LUPERODES CONVEXUS, new species

PLATE 5, FIGURE 13

About 3–4 mm. long, oblong oval, finely punctate, shining pale yellow, with mandibles, often the sides of the pronotum, margin and suture of elytra, breast, and tip of abdomen deeper brown, antennae brown with the first three joints and the base of the others pale.

Head finely punctate and alutaceous on occiput, tubercles and carina well defined. Interocular space half the width of the head. Antennae extending fully halfway down the elytra, three basal joints pale, the rest pale at the base, fourth joint nearly as long as second and third together, rest approximately equal. Prothorax a little less than twice as wide as long, with the sides slightly arcuate, surface finely and densely punctate, pale yellow, with the lateral margin and sometimes sides brownish. Elytra oblong oval, somewhat convex, without prominent humeri, surface finely and rather densely punctate, pale yellow with the sutural and marginal edges deep brown. Body

beneath finely pubescent, breast and tip of abdomen usually deeper in color. All tibiae with a spine, the first hind tarsal joint a little longer than the rest together. Anterior coxal cavities closed. Length 3-4 mm.; width 1.8-2.2 mm.

Type, male, and 2 paratypes (1 male, 1 female), U.S.N.M. No. 55121.

Type locality.—Armstrong, Iowa, collected by Shimek, from the Wickham collection.

Other localities.—Douglas County, Kans., collected by F. H. Snow; Topeka, Kans., in the Popenoe collection; Oklahoma County, Okla., collected by W. Benedict; Champaign, Ill., collected on the flowers of *Helianthus*.

Remarks.—This species is slightly larger and more convex than *varicornis* and more densely punctate. It is distinguished by its dark sutural and lateral edges, the characters of the aedeagus, and its elytral convexity, as well as its somewhat larger size from the other pale species.

LUPERODES OCULARIS, new species

PLATE 5, FIGURE 6

About 2.5 mm. in length, elongate oblong, pale yellow-brown, with the occiput, antennae, often lateral margin of prothorax and sutural and marginal edges of elytra, and breast deeper brown; smooth, shining, finely punctate; eyes unusually large.

Head shining, with a few fine rather obsolete punctures on the occiput, groove above tubercles deep and extending from eye to eye; eyes large, the interocular space less than half the width of the head. Antennae extending at least to the middle of the elytra, second and third joints together not quite so long as the fourth, the rest subequal; the basal joints paler than the outer ones. Prothorax almost rectangular, with lateral sides nearly straight, not twice as wide as long; surface shining, very finely and rather densely punctured. Lateral sides often darkened. Scutellum pale. Elytra long, narrow, and depressed, with well-marked humeri, and intrahumeral depression; surface shining, finely and rather densely punctate. Body beneath finely pubescent. Breast usually deeper brown; all tibiae with tiny spurs; first hind tarsal joint a little longer than remainder all together. Anterior coxal cavities closed. Length 2.5-3 mm.; width 1.2 mm.

Type, male, and 8 paratypes, the type and 6 paratypes in the California Academy of Sciences, 2 paratypes (male and female) in National Museum collection, U. S. N. M. No. 55122.

Type locality.—Baboquivari Mountains, Ariz., collected on August 20, 1924, by O. C. Poling.

Other localities.—Tucson, 16 miles south of Tucson, St. Xavier Mission, Ariz., collected in July and August 1924 by E. P. Van Duzee and J. O. Martin.

Remarks.—This species is distinguished by its tiny size, narrow shape, and very large eyes. The aedeagus is very similar to that of *L. brunneus* but is not so long or so slender at the tip. Three specimens of this species are in Fall's collection at Cambridge, all from the Baboquivari Mountains, Ariz.

LUPERODES PUNCTATISSIMUS, new species

PLATE 5, FIGURE 11

About 4 mm. in length, broadly oval, feebly shining, conspicuously and densely punctate, pale yellow, a dark line down the occiput and rather indefinite darker areas on prothorax, lateral edges of prothorax, and elytra, the suture dark in one of the two specimens; antennae with the first three joints pale, the rest gradually darker at apex.

Head alutaceous, finely and densely punctate over occiput, a dark median line, tubercles well defined, interocular space not quite half as wide as head. Antennae extending beyond the middle of the elytra, first three joints pale yellow, the rest with deeper colored apex, but not black, fourth joint about twice as long as third, the rest a little shorter and nearly equal. Prothorax one and three-fourths times as wide as long, with the sides nearly straight, basal margin curved; surface somewhat coarsely and confluent punctate, pale with two lateral darker areas and dark edges in one of the two specimens. Scutellum dark in one specimen. Elytra smoothly rounded, somewhat convex, without depressions, surface densely and distinctly punctate, with finer punctures among the coarser, deeper ones. Body beneath pale, shining. Legs pale, first tarsal joint of hind leg considerably longer than rest together. Anterior coxal cavities closed(?). Length 4 mm.; width 2 mm.

Type, male, and 1 paratype, female, U. S. N. M. No. 55123.

Type locality.—Arizona, "collection C. V. Riley."

Remarks.—This species is distinguished by its conspicuous punctation, its broadly oval shape, its convex and not depressed elytra, and the characters of the aedeagus.

LUPERODES VANDYKEI, new species

PLATE 5, FIGURE 3

About 3.5 mm. in length, elongate oblong, pale yellow, with the head, undersurface, and apical joints of the antennae deeper in coloring, faintly shining.

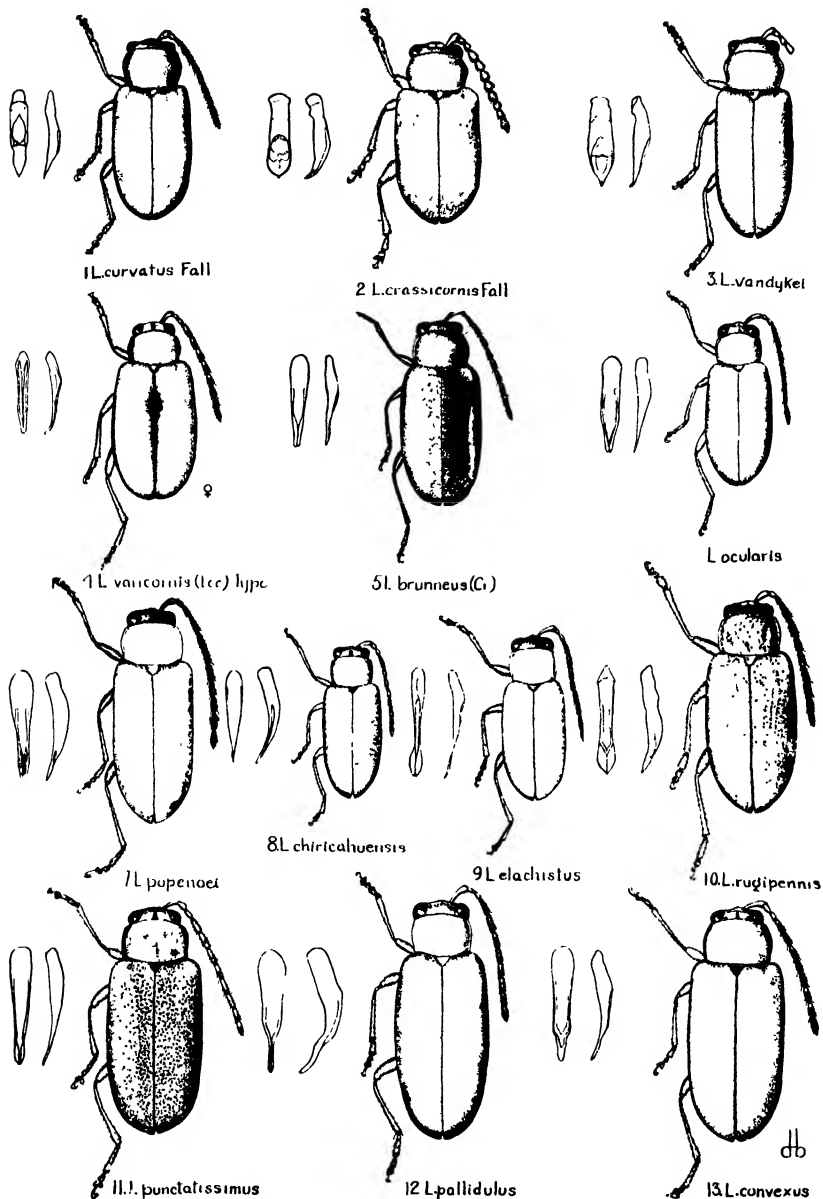
Head with the interocular space over half its width, smoothly rounded over the occiput, shining, a depression above the tubercles. Antennae pale, the second and third joints together fully as long as

fourth, remainder somewhat shorter, not reaching the middle of the elytra. Prothorax about a third wider than long, widest before the middle, surface smooth, impunctate, entirely pale. Elytra elongate oblong, with well-marked humeral prominences, surface finely alutaceous, entirely pale, lateral margin not visible from above. Body beneath shining, darker brown in color, with fine pubescence. Legs pale with deeper brown tarsal joints, all tibiae with tiny spur, first hind tarsal joint not so long as the rest together. Anterior coxal cavities closed(?). Length 3.5 mm.; width 1.3 mm.

Type, male, in the collection of the California Academy of Sciences.

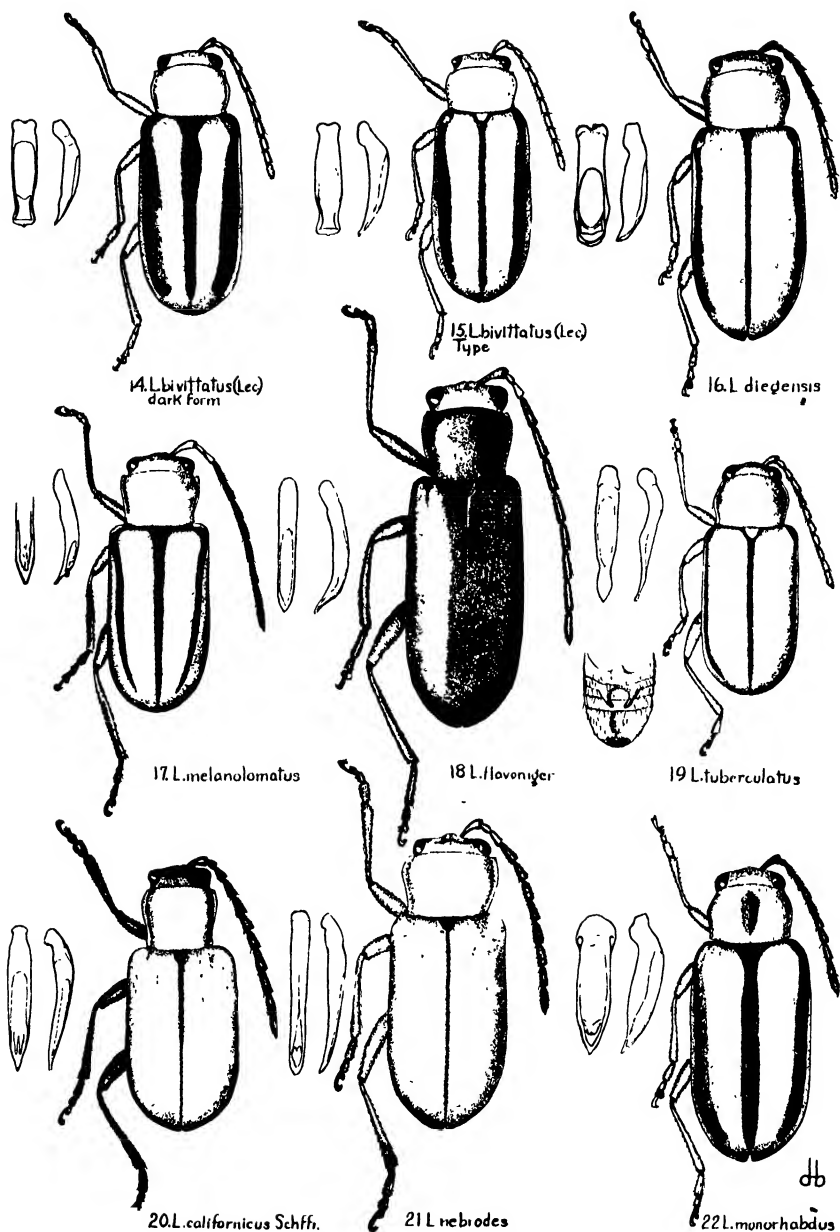
Type locality.—Olancho, Calif., collected May 19, 1917; in the Van Dyke collection, California Academy of Sciences.

Remarks.—This species, of which only a single specimen has been examined, is closely related to *L. curvatus* Fall and *L. crassicornis* Fall but not very closely allied to the *varicornis* group. It agrees with Fall's two species in having a broad head, the prothorax wider before the middle, the elytra rather convex, so that the lateral margin is not visible from above, and in having a short hind tarsal joint. The aedeagi of all three species are short and relatively broad. The male antennae are not thickened in this species as they are in *L. crassicornis*, and the beetle is not so broad as but more elongate than *L. curvatus*, with a differently shaped aedeagus.



BEETLES OF GENUS LUPERODES

- 1, *L. curvatus* Fall, paratype from Bishop, Calif.; 2, *crassicornis* Fall, paratype from Mojave, Calif.; 3, *vandykei*, new species, type from Olancha, Calif.; 4, *varicornis* (LeConte), type from Arizona, aedeagus from specimen from Nogales, Ariz.; 5, *brunneus* (Crotch), from Hamlet, N. C.; 6, *ocularis*, new species, type from Baboquivari Mountains, Ariz.; 7, *popenoei*, new species, type from Kansas; 8, *chiricahuensis*, new species, type from Chiricahua Mountains, Ariz.; 9, *elachistus*, new species, type from Las Vegas, N. Mex.; 10, *rugipennis*, new species, from San José del Cabo, Baja California; 11, *punctatissimus*, new species, type from Arizona; 12, *pallidulus*, new species, from Texas (Knab collection); 13, *convexus*, new species, from Topeka, Kans.



BEETLES OF GENUS LUPERODES

- 14, *L. bivittatus* (LeConte), dark form from Chico, Calif.; 15, *bivittatus*, type from Fort Tejon, Calif., genitalia from specimen from Potwisha, Sequoia National Park, Calif.; 16, *diegensis*, new species, type from San Diego, Calif.; 17, *melanolomatus*, new species, from California; 18, *flavoniger*, new species, type from El Toro, Orange County, Calif.; 19, *tuberculatus*, new species, type from Camp Baldy, Calif.; 20, *californicus* Schaeffer, from Kaweah, Calif.; 21, *nebrodes*, new species, type from Downings Ranch, Terrell County, Tex.; 22, *monorhabdus*, new species, type from Los Angeles County, Calif.



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NOTES ON THE CLASSIFICATION OF THE STAPHYLINID BEETLES OF THE GROUPS LISPINI AND OSORIINAE

By RICHARD E. BLACKWELDER

Two groups of Staphylinidae that have not seemed entirely satisfactory in our classification of the family Staphylinidae are the Lispini and the Osoriini. In each case there has been uncertainty as to the relationships, as shown by rather veiled suggestions that each is not entirely satisfactory where it has been placed.

The group Lispini has been placed as a subtribe of the tribe Piestini or as a tribe (Lispinini) of the subfamily Piestinae. The Piestinae has not been found to be a homogeneous group and has been very difficult to define. In recent works this has led to the inclusion of the Piestinae in the Oxytelinae as the tribe Piestini, but in this position it merely adds to the heterogeneity of the Oxytelinae. The group Osoriinae has nearly always been placed in the Oxytelinae, usually as a tribe. It agrees with typical oxytelines in relatively few characters and adds to the difficulty of defining that group.

During recent studies in the Piestinae it was found that the Piestinae can be separated into two groups by use of the character of the presence or absence of paratergites on the abdomen (abdomen margined or not). This appears to be a fundamental character. When it was recalled that the Osoriini may also be separated from the other Oxytelinae by the same character, it was obvious that a comparison of the two groups might lead to further discoveries.

Examination of the Osoriinae and Piestinae shows that five groups are extremely similar in most respects of their morphology as well as in a certain constant appearance. These are the Lispinini, Leptochirini, Thoracophorini, Osoriini, and Eleusii. These form a relatively homogeneous group immediately recognizable by the complete absence

of abdominal paratergites (margining). This character will distinguish them at once from all other Staphylinidae (except possibly some of the highly specialized inquilines). The only character found that will distinguish the Osoriini from the other four groups is the presence of a transverse sulcus on the anterior coxa. It is therefore concluded that these groups must all be placed in one subfamily, which will properly be called the Osoriinae. This group has nothing to do with the Oxytelinae, and while at present it must be placed after that subfamily, future rearrangements in the family are certain to separate them widely.

If this character of the coxal sulcus be used as the primary basis for dividing the subfamily, one gets two groups, the Osoriini and the remainder, the latter being separable on the closure of the coxal cavities into Leptochirini and LISPININI. These three tribes will then comprise the subfamily Osoriinae.

KEY TO TRIBES OF OSORIINAE

1. Anterior coxa conical, prominent, and with a transverse sulcus on anterior face..... OSORIINI
Anterior coxa usually small, globose, never with a transverse sulcus..... 2
2. Anterior coxal cavities closed behind..... LEPTOCHIRINI
Anterior coxal cavities open behind..... LISPININI

In the LISPININI there are two groups of genera that have been rather heterogeneous. In each group there were some genera having the anterior coxae separated by a spatulate process of the prosternum and some not. It seems certain that we are here dealing with a group in which similar appearance has arisen in several stocks. This parallelism is very confusing if only specific characters or general facies are observed. However, the lumping of all these genera and then their initial segregation on the character of the separation of the anterior coxae gives us two groups that while somewhat heterogeneous in appearance are much more homogeneous structurally than those obtained by the previous method. This division of the groups seems to be an important one, and the character is more usable than that of the shape and size of the coxae, with which it is correlated. The use of this character of the separation of the coxae, along with the others, enables us to divide the tribe into five subtribes.

KEY TO SUBTRIBES OF LISPININI

1. Anterior coxae separated by a flat process of prosternum..... 4
Anterior coxae not separated (except sometimes narrowly under the coxae).... 2
2. Pronotum half as wide at base as apex..... ELEUSII
Pronotum not so much narrowed at base..... 3
3. Gular sutures widely divergent posteriorly..... THORACOPHORI
Gular sutures absent, united, or approximate throughout..... PARALISPINI
4. Head narrowed to a neck behind..... CALOCERI
Head not forming a neck..... LISPINI

The relationships of these subtribes cannot be determined by their general appearance, since some Lispini are very similar to some Paralispini; the Caloceri are somewhat like the Thoracophori; and some Paralispini are said to be similar to some Thoracophori. The actual classification based on species available is given later in this paper, and an outline is presented here:

- Subfamily OSORIINAE
 - Tribe LISPININI
 - Subtribe LISPINI
 - Subtribe CALOCERI
 - Subtribe THORACOPHORI
 - Subtribe ELEUSII
 - Subtribe PARALISPINI
 - Tribe LEPTOCHIRINI
 - Tribe OSORIINI

The subtribes Lispini and Paralispini (together the subtribe Lispini of Bernhauer and Schubert) are the only ones of which a study of the genera has been attempted in this paper. In the Paralispini I recognize four generic names, *Ischiopsaurus*, *Lispinodes*, *Neolispinus*, and *Paralispinus*. Of *Paralispinus* I have seen several species, but of the other three genera no examples have been available. The original descriptions do mention the characters necessary to allow a reasonable assurance that the genera are properly placed here, but it has not been found practicable to write a useful key to these genera. The genus *Paralispinus* occurs throughout the world (at least the warmer parts), *Neolispinus* occurs in the Malay Peninsula, *Lispinodes* has been recorded from the Indo-Malayan region, Hawaii (and South America), and *Ischiopsaurus* from Madagascar and the Philippine Islands.

After the removal of the four genera to the Paralispini, the Lispini is left with three valid names, *Holosus*, *Lispinus*, and *Pseudolispinodes*. These three are all represented by series of species, but, since the conception of the genera is considerably changed here from that which was formerly available, many of the species must be shifted from one genus to another. In each of these genera several groups of species can be recognized and are herein named as seven new subgenera.

KEY TO GENERA AND SUBGENERA OF LISPINI

1. Abdominal sternites with diagonal strigae..... 2
 Abdominal sternites without diagonal strigae..... (*Pseudolispinodes*).. 6
2. Hypomeron with an angulate raised line from posterior corner toward coxa
 and then toward front corner; epipleura of elytra broader than intercoxal
 process of prosternum..... (*Holosus*).. 3
 Hypomeron with arcuate line marked at most by difference in sculpture;
 epipleura not broader even near base than intercoxal process. (*Lispinus*).. 5
3. Angle of hypomeral line near coxa acute..... 4
 Angle of hypomeral line near coxa right or obtuse..... subg. *Belinda*

4. Pronotum strongly narrowed in front..... subg. *Holocus*
Pronotum distinctly narrowed behind.....subg. *Neolocus*
5. Pronotum with longitudinal depression along side from base.. subg. *Lispinus*
Pronotum with abrupt fovea at side near basal third..... subg. *Spinilus*
6. Integuments of head, pronotum, and elytra entirely impunctate, smooth,
shining..... subg. *Nacaeus*
Integuments of head, pronotum, and elytra more or less densely punctured or
sculptured..... 7
7. Pronotum parallel or narrowed only in front..... subg. *Bumeba*
Pronotum narrowed behind, usually obviously..... 8
8. Base of pronotum about three-fourths as wide as base of elytra; elytra and
tergites without row of punctiform foveae..... subg. *Pseudolispinodes*
Base of pronotum not less than nine-tenths as wide as base of elytra; elytra
with two and each tergite with one pair of punctiform foveae, all in line,
those of tergites sometimes less evident..... 9
9. Femora very much enlarged; pronotum with two large punctiform foveae
along front margin..... subg. *Liberiana*
Femora only moderately enlarged; pronotum without foveae along front
margin..... subg. *Liberiella*

The groups herein outlined are characterized in part below. Synonymy has been added to the genera with discussion of certain points.

Subfamily OSORIINAE

Antennae 11-segmented, inserted under the anterior corners of the vertex, near the eyes; maxillary palpus 4-segmented, filiform; labial palpus 3-segmented; gular sutures united or closely approximated at least in part (or absent); abdomen entirely without paratergites; first and second abdominal sternites absent (*Eumalus* has some trace of sclerotization).

Tribe LISPININI

Anterior coxa usually small and globose, without a transverse sulcus on anterior face; anterior coxal cavities open behind.

Remarks.—This tribe is homogeneous in most structural characters but is readily divided into five subtribes on less important features as well as by appearance. Of these five subtribes the Caloceri and Lispini form one group, while the Thoracophori, Eleusii, and Paralispini form another.

Subtribe LISPINI

Head not forming a neck; anterior coxae separated by a flat process of the prosternum; tarsi 5-segmented (sometimes indistinctly).

Subtribe CALOCERI

Head narrowed to a neck behind; anterior coxae separated by a flat process of the prosternum.

Subtribe THORACOPHORI

Anterior coxae not separated by a flat process of the prosternum; prosternum not greatly elongate; gular sutures widely divergent posteriorly.

Subtribe ELEUSII

Head usually margined behind the eyes above; gular sutures usually widely divergent posteriorly; pronotum very much narrowed at base; prosternum sometimes very much elongate; anterior coxae small and globose, not separated by a flat process of the prosternum; tarsi 5-segmented.

Remarks.—This subtribe contains only *Eleusis* and *Eumalus*. *Triga* (*Pseudeleusis*) has the abdomen strongly margined and does not belong in this subfamily at all.

Subtribe PARALISPINI

Gular sutures absent, or approximate throughout; anterior coxae not separated by a flat process of the prosternum; tarsi 5-segmented (sometimes indistinctly).

(See remarks above.)

Tribe LEPTOCHIRINI

Anterior coxa small and globose, without a transverse sulcus on the anterior face; anterior coxae separated by a flat process of the prosternum; anterior coxal cavities closed behind; tarsi 5-segmented.

Remarks.—This tribe is well marked and easily recognizable. It contains the genera *Leptochirus*, *Borolinus*, *Priochirus*, and *Thora-cochirus*, as well as 13 other names considered to represent subgenera.

Tribe OSORIINI

Anterior coxa conical and prominent, with a transverse sulcus on the anterior face; anterior coxae separated at the height of the sternum by a narrow process of the prosternum; tarsi 5-segmented.

Genus PSEUDOLISPINODES Bernhauer

Pseudolispinodes BERNHAUER, Philippine Journ. Sci., vol. 31, p. 258, 1926.

Diagnosis.—Having the characters listed above for the subfamily Osoriinae, the tribe Lispinini, and the subtribe Lispini; pronotum more or less narrowed behind; abdominal sternites without diagonal strigae.

Remarks.—This genus was erected for three species from the Philippines (*longipennis*, *latiusculus*, and *sinuatus*) and one from East

India (*madurensis*). Both *sinuatus* and *madurensis* were originally described in the genus *Holopus*.

In the Journal of the Federated Malay States Museums in 1929 (vol. 14, p. 438) Cameron added a new species from the Malay Peninsula (*selangorensis*), and in 1930 in the Fauna of British India (Staphylinidae, vol. 1, p. 66) he transferred *bistriatus* Fauvel of the Indo-Malayan region from *Lispinodes* and placed *madurensis* Bernhauer as a synonym. Of these six names, representatives of *madurensis*, *sinuatus*, *selangorensis*, and *bistriatus* are available for study. Under the present definition of the genera of this tribe, *longipennis*, *sinuatus*, and *bistriatus* are definitely not *Pseudolispinodes* and should be transferred to *Lispinus*.

In the case of *madurensis* there have apparently been some errors and surely some uncertainty. The following review may justify the conclusion I have reached at this time:

1914. *Holopus madurensis* (Bernhauer, Verh. zool.-bot. Ges. Wien, vol. 64, p. 83), described by comparison with *Holopus sinuatus* Bernhauer from one example from "Chambaganoor (Madura, Ostindien)."

1915. *Lispinus madurensis* (Bernhauer, Ent. Blätter, vol. 11, p. 251), described by comparison with *Lispinus impressicollis* Motschulsky, from one example from "Chambaganoor (Madura, Südindien)."

1933. In the Coleopterorum Catalogus (pars 129) Scheerpeltz (following Cameron in the Fauna of British India) listed these species as follows (pp. 1010 and 1015, respectively):

Pseudolispinodes bistriatus Fauvel, 1895 (syn. *madurensis* Bernhauer, Verh. zool.-bot. Ges. Wien, vol. 64, p. 83, 1914). From "O. Ind.: Burma, Madura, Sikkim; Indo-China, Philippines, Sumatra."

Lispinus madurensis Bernhauer, Ent. Blätter, vol. 11, p. 251, 1915. From "O. Ind.: Nilgiri-Hills, Madura."

It was assumed both by Cameron and by Scheerpeltz that the two species were distinct and that they belonged in different genera. Cameron recorded that he had seen the type of *Lispinus madurensis* Bernhauer, 1915, but not of the other.

1942. Specimens labeled *Lispinus madurensis* Bernhauer from the Nilgiri Hills (identified by Dr. Cameron) are in both the Baker collection in the U. S. National Museum and in my own collection.

(1) These specimens belong to *Pseudolispinodes* as herein defined,

(2) They agree closely with Bernhauer's comparison of *madurensis* and *sinuatus* (1914),

(3) They agree closely with Bernhauer's comparison of *madurensis* and *impressicollis* (1915),

(4) They are quite distinct from *bistriatus* from several collections (including several identifications by Dr. Cameron).

From these facts I conclude that Bernhauer described his one Chambaganoor specimen twice as a new species, placing it in two distinct genera. Cameron saw the specimen with the later label of *Lispinus madurensis*, recognized more specimens in his own material from Nilgiri Hills, and then surmised that the unseen *Holopus* (by

that time *Pseudolispinodes*) *madurensis* was identical with *bistriatus*. The synonymy of these names should be as follows:

LISPINUS BISTRIATUS (Fauvel)

Lispinodes bistriatus FAUVEL, Rev. d'Ent., vol. 14, p. 185, 1895.

Pseudolispinodes bistriatus (Fauvel) CAMERON, Fauna of British India, Staphylinidae, vol. 1, p. 66, 1930.

PSEUDOLISPINODES MADURENSIS (Bernhauer)

Holosus madurensis BERNHAUER, Verh. zool.-bot. Ges. Wien, vol. 64, p. 83, 1914.—CAMERON, Fauna of British India, Staphylinidae, vol. 1, p. 59, 1930 (as synonym of *bistriatus*).

Lispinus madurensis BERNHAUER, Ent. Blätter, vol. 11, p. 251, 1915 (as a new species).—CAMERON, Fauna of British India, Staphylinidae, vol. 1, p. 59, 1930.

Pseudolispinodes madurensis (Bernhauer, 1915) CAMERON, Fauna of British India, Staphylinidae, vol. 1, p. 59, 1930 (as synonym of *bistriatus*).—BERNHAUER, Philippine Journ. Sci., vol. 31, p. 260, 1926.

From examination of specimens available in the U. S. National Museum I am able to transfer to this genus 22 additional species, all of which were previously included in *Lispinus* or *Paralispinus*. Certain of these can be immediately recognized by a peculiar habitus and stand out from all the rest. They are here segregated as five subgenera:

Subgenus PSEUDOLISPINODES sensu stricto

Diagnosis.—Having the characters listed above for the genus *Pseudolispinodes*; integuments punctured or sculptured, not entirely smooth; pronotum distinctly narrowed behind, much narrower at base of elytra, without anterior submarginal foveae; elytra and abdominal sternites without rows of punctiform foveae; femora not or only moderately enlarged.

Remarks.—This subgenus is probably a large one. I have seen 23 species belonging to it, all of which are very similar in appearance as well as in structure.

LIBERIELLA, new subgenus

Genotype.—*Pseudolispinodes* (*Liberiella*) *cooki*, new species (see p. 86).

Diagnosis.—Having the characters listed above for the genus *Pseudolispinodes*; pronotum scarcely narrowed behind, only slightly narrower at base than elytra; elytra and abdominal sternites with a row of punctiform foveae, sometimes obsolescent on the abdomen; femora only moderately enlarged.

Remarks.—Four species from Africa appear to form an isolated group in *Pseudolispinodes*, distinguished by the form of the pronotum which imparts a distinctive appearance. Three of these species are

undescribed; the fourth (*aethiops* Eppelsheim) is known to me only from one specimen, without locality data. Rather than base a genus on a possible misidentification, I base it on one of the supposedly new species from Liberia (see description, p. 86) and list *aethiops* and the other two (undescribed) species as congeneric.

LIBERIANA, new subgenus

Genotype.—*Pseudolispinodes* (*Liberiana*) *femoralis*, new species (see p. 86).

Diagnosis.—Having the characters listed above for the genus *Pseudolispinodes*; pronotum only moderately narrowed behind, about one-tenth narrower at base than base of elytra; pronotum with two anterior submarginal foveae; elytra and abdominal tergites with a row of large punctiform foveae; femora very much enlarged (especially the posterior, which is one-fourth as broad as long).

Remarks.—Two species from Liberia are assigned to this subgenus. (One of these is described below, p. 86). They differ from the other subgenera in the enlargement of the femora and in the peculiar arrangement of the punctiform foveae of the elytra and abdomen.

RUMIBA, new subgenus

Genotype.—*Pseudolispinodes* (*Rumiba*) *lispinoides*, new species (see p. 87).

Diagnosis.—Having the characters listed above for the genus *Pseudolispinodes*; integuments punctured or sculptured, not entirely smooth; pronotum parallel or narrowed only in front.

Remarks.—This subgenus differs considerably from *Pseudolispinodes* in appearance, principally because of the shape of the pronotum and the generally greater convexity of the body. It is represented by a single species from Liberia described on page 87.

NACAEUS, new subgenus

Genotype.—*Pseudolispinodes* (*Nacaeus*) *planellus* (Sharp).

Diagnosis.—Having the characters listed above for the genus *Pseudolispinodes*; body very depressed and slender; integuments unusually shining smooth; each elytron with a single large discal puncture.

Remarks.—This subgenus is distinguished more by its appearance than by characters of morphology. It is similar to *Pseudolispinodes* except for the complete lack of sculpture, its narrow depressed form, and the rotund shape of the head. It is represented before me by two species, of which one is undescribed. *P. (N.) planellus* (Sharp) occurs in Central America, central Africa, Singapore, and the Philippine Islands. The Oriental specimens were identified as *Paralispinus*

nitidissimus Bernhauer by Bernhauer, but I am unable to distinguish them from Panama examples of *planellus*.

Examples in the Baker collection identified by Dr. Cameron as *Paralispinus exiguus* Erichson are quite distinct from that species (and genus) as it occurs at the type locality (Puerto Rico).

Genus LISPINUS Erichson

Lispinus ERICHSON, Genera et species Staphylinorum, p. 828, 1840.

Diagnosis.—Having the characters listed above for the subfamily Osoriinae, the tribe Lispinini, and the subtribe Lispini; gular sutures usually present, sometimes merely as pits; hypomeron with a raised line, which forms a right or obtuse angle near the front coxa; cavity of the mesosternum feeble with sides not elevated; abdominal sternites with diagonal strigae, which are sometimes not completely separate from the coarse punctures.

Remarks.—The removal to *Pseudolispinodes* of the species not having diagonal strigae on the sternites, to *Holusus* of those having an acute hypomeral angle, to *Relinda* of those having a modified mesosternum, and to *Paralispinus* of those with contiguous anterior coxae leaves in *Lispinus* a homogeneous series of species, of which each agrees closely with the genotype in structural characters. This series can be separated into two groups by the structure of the pronotum. The 18 species that I have examined and am placing in this genus have previously been placed there with the exception of *bistriatus* Fauvel, *longipennis* Cameron, and *sinuatus* Bernhauer, which were described and cataloged in *Lispinodes* and *Holusus*. This will probably still be a fairly large genus when all the foreign elements have been removed from it.

Subgenus LISPINUS sensu stricto

Diagnosis.—Having the characters listed above for the genus *Lispinus*; pronotum scarcely narrower at base than base of elytra; side of pronotum with a longitudinal fovea from base.

Remarks.—The typical subgenus will undoubtedly contain most of the species assigned to this genus. I have seen 16 species, which differ only slightly in appearance and not appreciably in structure.

SPINILUS, new subgenus

Genotype.—*Lispinus* (*Spinilus*) *bistriatus* (Fauvel) (see p. 81).

Diagnosis.—Having the characters listed above for the genus *Lispinus*; pronotum much narrower at base than base of elytra; side of pronotum with an abrupt fovea near basal third instead of the usual longitudinal depression.

Remarks.—This subgenus is erected for two species from the Orient (*bistriatus* and *sinuatus*), which have an unusually strongly narrowed pronotum and a different type of lateral fovea. They are readily distinguished from *Lispinus* sensu stricto.

Genus HOLOSUS Motschulsky

Holusus MOTSCHULSKY, Bull. Soc. Imp. Nat. Moscou, vol. 30, p. 496, 1857.

Diagnosis.—Having the characters listed above for the subfamily Osoriinae, the tribe Lispinini, and the subtribe Lispini; pronotum broad, strongly narrowed in front or behind; hypomeron with a raised line forming an angle near the front coxa; abdominal sternites with diagonal strigae.

Remarks.—This genus was originally described for five new species thought to be related to *Lispinus* and *Holotrochus* but distinguished by the body shape, which is broader and more like that of certain Tachyporinae. All five of these species were described as having the diagonal strigae on the abdominal sternites. Most of the species subsequently assigned to the genus had these diagonal strigae, but many species of *Lispinus* also had that character, and the two genera have been separated principally on the rather unsatisfactory difference in their shape.

I have found that some of the original species of *Holusus* (*tachiniformis*, *mycetoporiformis*, and *olisthaeriformis*) differ from one of the others in having the raised line on the hypomeron (the deflexed portion of the pronotum) enclosing a much larger and more transverse area, the angle of this line nearest to the coxa being distinctly acute, whereas in *tachyporiformis* it is right or obtuse. For the latter I am proposing the subgenus *Neolusus*, but the first group contains two very different pronotal types. *H. tachiniformis* has the pronotum transverse and strongly narrowed in front and is placed in the subgenus *Holusus* sensu stricto. *H. mycetoporiformis* and *olisthaeriformis* have the pronotum narrowed behind with the sides emarginate and are placed in the new subgenus *Relinda*.

I have seen only six species that can be retained in this genus as here defined.

Subgenus HOLOSUS sensu stricto

Diagnosis.—Having the characters listed above for the genus *Holusus*; pronotum not transversely impressed before base, strongly narrowed in front; hypomeron with a raised line forming an acute angle near the front coxa and enclosing a large and nearly transverse area.

Remarks.—This subgenus has a very distinctive form. It probably includes all the species that might be described as navicular, those

which depart most widely from the more general slender form of this tribe. I have seen only two species that belong here, *H. tachini-formis* and *H. navicularis* Cameron.

NEOLOSUS, new subgenus

Genotype.—*Holosus* (*Neolosus*) *tachyporiformis* Motschulsky.

Diagnosis.—Having the characters listed above for the genus *Holosus*; general form similar to subgenus *Relinda*; pronotum distinctly narrowed behind, transversely impressed before base; hypomeral line distinct but enclosing a longitudinal area, and with the angle near the coxa right or obtuse (and somewhat rounded).

Remarks.—*Holosus tachyporiformis* Motschulsky and *H. insularis* Fauvel differ so much from *H. tachini-formis* Motschulsky in the shape of the pronotum that I separate them under this name. Their form is rather similar to that of the other new subgenus *Relinda*, from which they differ in the hypomeral angles being not acute.

RELINDA, new subgenus

Genotype.—*Holosus* (*Relinda*) *mycetoporiformis* Motschulsky.

Diagnosis.—Having the characters listed above for the genus *Holosus*; hypomeron with a raised line forming a right or obtuse angle near the front coxa; mesosternum with a cavity with abruptly elevated sides for the reception of the tip of the prosternum.

Remarks.—This subgenus is proposed for the inclusion of two species of *Holosus* (*olisthaeriformis* and *mycetoporiformis*) that differ structurally from the types of *Holosus* sensu stricto and *Neolosus*, although having an appearance much like the species of *Neolosus*.

Genus PARALISPINUS Bernhauer

Ancaeus FAUVEL, Bull. Soc. Linn. Normandie, vol. 9, p. 60, 1865 (not Risso, 1816).

Paralispinus BERNHAUER, Deutsche Ent. Zeitschr., 1921, p. 67 (as a new name).

Remarks.—This genus is included here because it has almost invariably been confused with *Lispinus* or *Pseudolispinodes*. It was founded by Fauvel for a single species from Mexico (*megacephalus*), of which I have three examples from Guatemala and one fragmentary specimen from Costa Rica. Sharp, in the Biologia Centrali-Americana, recognized the unusual structure of the prosternum and anterior coxae, and the segregation of this genus (and certain others) on this character aids greatly in the study of the Lispinini (the Lispini of most writers).

I have examined six species that must at present be placed in this genus. These all occur in the Western Hemisphere with the exception of an undescribed species from central Africa. *P. exiguus*

Erichson is recorded from India, Ceylon, Assam, Singapore, New Guinea, and the Hawaiian Islands, as well as from the Americas, but examples from Singapore identified by Dr. Cameron are certainly *Pseudolispinodes* (subgenus *Nacaeus*). Whether the species actually occurs outside the New World I am unable to determine at present.

DESCRIPTIONS OF NEW SPECIES

PSEUDOLISPINODES (LIBERIELLA) COOKI, new species

Description.—Rufous, sometimes picescent in part. Head broadly rounded in front, a trifle broader behind the eyes, which are very feebly prominent; clypeus with a distinct marginal bead, which fades out at front of eye; with fine punctures separated by two to four times their diameter and with dense but fine scaly ground sculpture.

Pronotum about one-fourth wider than long, widest about middle, nearly straight and feebly converging posteriorly, feebly arcuate and rather indefinitely narrowed in front; feebly impressed at posterior angles, the depression extending about to middle; without foveae on front margin; punctures a little coarser than on head, separated by two to three times their diameters, without larger punctures; with obsolescent longitudinal ground sculpture.

Elytra at base as wide as base of pronotum, expanded to apical third; without obvious fovea inside humeral callus; with punctures finer than on head but slightly elongate, separated by two to four times their diameter; ground sculpture as on pronotum but a little more distinct; with a median discal punctiform fovea, excavated behind, at basal third and another subapical.

Abdomen punctured as elytra but less distinctly; ground sculpture scaly, more evident basally; a pair of punctiform foveae on each tergite at basal third, separated by one-third of width.

Length, $2\frac{3}{4}$ to 3 mm.

Types.—Holotype and nine paratypes (U. S. N. M. No. 52590), collected at Mount Coffee, Liberia, in March 1897 by Dr. O. F. Cook.

PSEUDOLISPINODES (LIBERIANA) FEMORALIS, new species

Description.—Piceorufous. Head broadly rounded in front, a trifle broader behind the eyes which are only moderately prominent; clypeus with a rather coarse marginal bead, which disappears at front of eye; feebly biimpressed between the antennal prominences; with fine punctures separated by two to three times their diameter but almost completely obscured by very coarse strigulose ground sculpture, which is not scaly but somewhat tortuous; with dense scaly sculpture behind the eyes.

Pronotum scarcely measurably wider than long, widest at anterior third, sides feebly rounded to front angles, abruptly but feebly converging behind from basal third; with well-defined fovea at basal angle extending almost to middle; disk flattened along middle; with two anterior submarginal foveae formed of posteriorly excavated punctures, and with a pair of large punctures correspondingly on the posterior margin; punctures a little coarser than on head, not so much obscured by the sculpture, which is less dense.

Elytra at base less than one-twelfth wider than base of pronotum, very feebly expanded to apical fourth; with very obtuse rounded fovea inside humeral callus; punctures finer than on head but equally obscured by the coarse and more regular strigulose ground sculpture; with a median discal punctiform fovea at basal third and another at apical sixth.

Abdomen with punctures of indeterminate size, more or less excavated behind, with traces of scaly ground sculpture inside the excavations; each tergite with a pair of large excavated foveae anteriorly, separated by one-third of the width (and others at sides and underneath).

Length, 6 to 7 mm.

Types.—Holotype and two paratypes (U. S. N. M. No. 52589) collected at Mount Coffee, Liberia, in February and March 1895 by Dr. O. F. Cook.

PSEUDOLISPINODES (RUMEBIA) LISPINOIDES, new species

Description.—Rufous. Head broadly arcuately truncate in front, a trifle wider behind the eyes, which are only slightly prominent; anterior margin finely beaded and extended as a ridge over the eye; almost entirely without prominences or depressions: with fine but somewhat irregular-sized punctures separated by two to four times their diameter; with ground sculpture obsolescent except at sides.

Pronotum three-fourths as long as wide, widest near middle, feebly narrowed behind with sides straight, feebly narrowed in front with sides feebly arcuate; depressed near hind angles but without distinct fovea or groove; disk not flattened; punctures as on head or more irregular, sometimes slightly elongate; without evident ground sculpture.

Elytra scarcely wider at base than base of pronotum, feebly expanded to middle half, which is parallel-sided; base without foveae; sutural band not abruptly elevated though distinct; punctures shallow, a little less distinct than on pronotum and a little sparser; ground sculpture obsolete.

Abdomen with punctures obsolete; scaly sculpture distinct at base of each tergite, obsolescent toward apex.

Length, $2\frac{1}{4}$ mm.

Types.—Holotype and six paratypes (U. S. N. M. No. 52588), collected at Mount Coffee, Liberia, in February 1897, March 1895, and April 1894 by Dr. O. F. Cook. One paratype from Monrovia, Liberia, February 1895.

GENOTYPES OF THE LISPININI

- Ancaeus* Fvl., *A. megacephalus* Fvl. (monobasic).
Aneucamptus Shp., *Thoracophorus excisicollis* Mots. = *A. excisicollis* (Mots.) (monobasic).
Bothrys Fvl., *B. personatus* Fvl. (monobasic).
Calocoris Fvl., *Thoracophorus cicatricosus* Mots. = *C. cicatricosus* (Mots.) (designated here).
Chasolium Cast., *C. ernestini* Cast. (monobasic).
Clavilispinus Bnhr., *Paralispinus* (*Clavilispinus*) *siargaoanus* Bnhr. (monobasic).
Diplopsis Fvl., *D. multicostata* Fvl. (designated here).
Eleusis Cast., *E. tibialis* Cast. (monobasic).
Espeson Schauf., *E. moratus* Schauf. (monobasic).
Eumalus Shp., *E. strigosus* Shp. (designated here).
Glyptoma Er., *G. crassicornis* Er. (designated by Duponchel, 1841).
Holusus Mots., *H. tachiniformis* Mots. (designated here).
Ischiopsaurus Bnhr., *I. boettcheri* Bnhr. (designated here).
Isomalus Er., *I. humilis* Er. (designated by Duponchel, 1841).
Leipophorus Bnhr., *Thoracophorus* (*Leipophorus*) *minutissimus* Bnhr. (designated here).
Liberiana Blkwr., *Pseudolispinodes* (*Liberiana*) *femoralis* Blkwr. (original designation).
Liberiella Blkwr., *Pseudolispinodes* (*Liberiella*) *cooki* Blkwr. (original designation).
Lispinodes Shp., *L. explicandus* Shp. (monobasic).
Lispinus Er., *L. attenuatus* Er. (designated by Duponchel, 1841).
Nacaues Blkwr., *Lispinus planellus* Shp. = *Pseudolispinodes* (*Nacaues*) *planellus* (Shp.) (original designation).
Neolispinus Cam., *N. crucifer* Cam. (monobasic).
Neolusus Blkwr., *Holusus tachyporiformis* Mots. = *Holusus* (*Neolusus*) *tachyporiformis* Mots. (original designation).
Paralispinus Bnhr., *Ancaeus megacephalus* Fvl. = *Paralispinus megacephalus* (Fvl.) (Rules, Article 30, f).
Parespeson Bnhr., *Espeson* (*Parespeson*) *angustissimus* Bnhr. (monobasic).
Pseudolispinodes Bnhr., *Holusus madurensis* Bnhr. = *Pseudolispinodes madurensis* (Bnhr.) (designated here).
Relinda Blkwr., *Holusus mycetoporiformis* Mots. = *Holusus* (*Relinda*) *mycetoporiformis* (Mots.) (original designation).
Rhopalophorus Bnhr., *R. gestroi* Bnhr. (monobasic).
Rumeba Blkwr., *Pseudolispinodes* (*Rumeba*) *lispinoides* Blkwr. (original designation).
Spinilus Blkwr., *Lispinodes bistriatus* Fvl. = *Lispinus* (*Spinilus*) *bistriatus* (Fvl.) (original designation).
Stilbogastus Bnhr., *Thoracophorus nitidus* Bnhr. = *Thoracophorus* (*Stilbogastus*) *nitidus* Bnhr. (monobasic).
Tetrapleurus Bnhr., *T. indicus* Bnhr. (monobasic).
Thoracophorus Mots., *T. corticinus* Mots. (monobasic).

GENERIC ARRANGEMENT AND SPECIES EXAMINED

An attempt is here made to arrange the genera and subgenera in a natural order, beginning with what seem to be the least specialized. The following systematic list has been expanded to contain a list of the species that were examined in each genus and subgenus. In each case are given the original genus, the genus in which it has been recently placed (if different from the one to which it is herein assigned), a key to the authority for the specific identification, and an indication of the habitat of the species. Abbreviations as follows are used to indicate the authority for the identifications of the species listed:

Cam..... Dr. Malcolm Cameron. Various.. Several independent sources.
 Bnhr..... Dr. Max Bernhauer. Type.... Holotype.
 REB..... Dr. R. E. Blackwelder. PT..... Paratype.
 USNM... U. S. National Museum collections.

Pseudolispinodes Bnhr.Subg. *Pseudolispinodes* s. str.

beesoni Cam. 1924 (*Lispinus*) (Cam)..... India
birmanus Fvl. 1895 (*Lispinus*) (Cam)..... East India
castaneus Fvl. 1878 (*Lispinus*) (Cam)..... Australia, New Guinea
coarcticollis Kr. 1859 (*Lispinus*) (Cam)..... Singapore
curtipennis Bnhr. 1929 (*Lispinus*) (Bnhr)..... Borneo
fulvus Mots. 1857 (*Lispinus*) (Bnhr)..... East India, Philippines
impar Cam. 1913 (*Lispinus*) (REB)..... West Indies
impressicollis Mots. 1857 (*Lispinus*) (Bnhr).... Africa—Malay—Hawaii
jyeri Bnhr. 1914 (*Lispinus*) (Cam)..... India
luzonicus Bnhr. 1929 (*Lispinus*) (Bnhr)..... Philippines
madurensis Bnhr. 1915 (*Holosus*) (*Lispinus*, *Pseudolispinodes*)
 (Cam)..... India
nigrifrons Fvl. 1863 (*Lispinus*) (REB)..... West Indies
[nitidipennis Bnhr. 1914 (*Lispinus*) (Bnhr) (part only; see
 Lispinus)..... Philippines]
quadripunctulus Fvl. 1865 (*Lispinus*) (USNM)..... Tropical America
rubidus Cam. 1925 (*Lispinus*) (Cam)..... Philippines
selangorensis Cam. 1929 (*Pseudolispinodes*) (*Lispinus*) (Cam).... Malay
sericeiventris Bnhr. 1914 (*Lispinus*) (Cam)..... Malay
specularis Bnhr. 1904 (*Lispinus*) (various)..... Malay
subopacus Kr. 1859 (*Lispinus*) (Cam)..... India, Malay
tenellus Er. 1840 (*Lispinus*) (REB)..... New World
sp. (REB)..... Argentina
sp. (REB)..... China
sp. (REB)..... Japan

Subg. *Liberiella* Blkwr.

aethiops Epp. 1895 (*Lispinus*) (Cam)..... Africa
cooki Blkwr. (Type)..... Liberia
sp. (REB)..... Liberia
sp. (REB)..... South Africa

Subg. *Liberiana* Blkwr.

femoralis Blkwr. (Type)..... Liberia
sp. (REB)..... Liberia

Pseudolispinodes Bnhr.—Continued.Subg. *Rumeba* Blkwr.*lispinoides* Blkwr. (Type)----- LiberiaSubg. *Nacaeus* Blkwr.[*exiguus* Er. (*Lispinus*) (Cam) (= *planellus* Shp.)----- Singapore][*nitidissimus* Bnhr. 1905 (*Ancaeus*) (*Paralispinus*) (various) (= *planellus* Shp.)----- Singapore]*planellus* Shp. 1887 (*Lispinus*) (*Paralispinus*) (REB)----- Panama

sp. (REB)----- Panama

Lispinus Er.Subg. *Lispinus* s. str.*aequipunctatus* LeC. 1868 (*Lispinus*) (USNM)----- North America*attenuatus* Er. 1840 (*Lispinus*) (REB)----- West Indies*bakeri* Bnhr. 1914 (*Lispinus*) (Bnhr)----- Philippines*catena* Shp. 1876 (*Lispinus*) (REB)----- Tropical America*granadensis* Fvl. 1865 (*Lispinus*) (PT)----- Central America*insularis* Fvl. 1863 (*Lispinus*) (REB)--- Central America, West Indies*laticollis* Er. 1840 (*Lispinus*) (REB)----- Central America, West Indies*linearis* Er. 1840 (*Lispinus*) (USNM)--- New World*lineatopunctatus* Bnhr. 1929 (*Lispinus*) (Bnhr)----- Philippines*longipennis* Cam. 1925 (*Holosus*) (*Pseudolispinodes*) (Cam)--- East India[*nitidipennis* Bnhr. 1914 (*Lispinus*) (Bnhr) (part only; see *Pseudolispinodes*)----- Philippines]*parallelus* Bnhr. 1929 (*Lispinus*) (Bnhr)----- Borneo*quadracollis* Cam. 1924 (*Lispinus*) (Cam)----- Northern India*quadrinotatus* Fvl. 1904 (*Lispinus*) (Bnhr)----- East India, Formosa*striola* Er. 1840 (*Lispinus*) (various)----- Tropical America*tardus* Shp. 1887 (*Lispinus*) (Bnhr, REB)--- Central America, West IndiesSubg. *Spinilus* Blkwr.*bistriatus* Fvl. 1895 (*Lispinodes*) (*Pseudolispinodes*) (various)--- India*sinuatus* Bnhr. 1904 (*Holosus*) (*Pseudolispinodes*) (Bnhr)--- Philippines*Holosus* Mots.Subg. *Holosus* s. str.*navicularis* Cam. 1936 (*Holosus*) (Cam)----- Java*tachiniformis* Mots. 1857 (*Holosus*) (Cam)----- JavaSubg. *Neolosus* Blkwr.*insularis* Fvl. 1904 (*Holosus*) (Bnhr)----- Borneo*tachyporiformis* Mots. 1857 (*Holosus*) (Cam)----- SumatraSubg. *Relinda* Blkwr.*mycetoporiformis* Mots. 1857 (*Holosus*) (Bnhr)--- East India, Philippines*olihaeriformis* Mots. 1857 (*Holosus*) (REB)----- Philippines*Paralispinus* Bnhr.*californicus* LeC. 1863 (*Lispinus*) (various)----- North America*exiguus* Er. 1840 (*Lispinus*) (*Ancaeus*, *Paralispinus*) (REB)---
New World, Africa*megacephalus* Fvl. 1865 (*Ancaeus*) (*Lispinus*) (Bnhr)--- Central America*politus* Shp. 1887 (*Ancaeus*) (REB)----- Central America, West Indies*prolixus* LeC. 1877 (*Ancaeus*) (*Lispinus*) (USNM)--- North America

sp. (REB)----- Panama

sp. (REB)----- Liberia



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SCORED BONE ARTIFACTS OF THE CENTRAL GREAT PLAINS

By W. R. WEDEL and A. T. HILL

THE known pottery wares of the central Great Plains fall into two main groups on the basis of the techniques employed in finishing vessel surfaces. These are (a) the paddle-marked wares, in which vessel exteriors bear impressions from a carved or wrapped instrument; and (b) the smoothed, polished, or slipped wares, which may or may not carry incised or trailed body ornamentation. Occasional smoothed or imperfectly polished sherds and vessels are likely to occur at almost any site where extended excavations are carried on. As the prevalent and characteristic type, however, pottery without paddle impressions is found principally along the Missouri River and in the lower drainages of its westerly tributaries. Several archeological horizons are concerned. They include the predominantly shell-tempered protohistoric Oneota and Oneotalike remains of eastern Nebraska and northeastern Kansas (Hill and Wedel, 1936); the grit-tempered prehistoric Nebraska Aspect materials, confined mostly to a narrow strip along the Missouri River bluffs (Strong, 1935, pp. 251-252; Bell and Gilmore, 1936, pp. 319, 326; Hill and Cooper, 1938); and the prehistoric shell-tempered wares with apparent Middle Mississippi affinities occurring in northwestern Missouri (Wedel, 1939) and in some of the Nebraska Aspect sites northward to the mouth of the Platte River near Omaha (Strong, 1935, p. 255). Plain ware also appears to constitute a considerable proportion of the pottery from protohistoric Dismal River sites in western Nebraska and Kansas (Hill and Metcalf, 1942, p. 181).

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91

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Paddle-marked pottery is of two kinds. The earlier and more widely distributed is that in which a cord-wrapped implement was applied over the entire exterior surfaces of the vessels. Pottery so treated is one of the most typical features at prehistoric Upper Republican Aspect sites scattered throughout the drainages of the Smoky Hill, Solomon, Republican, Blue, Loup, and upper Elkhorn Rivers (Wedel, 1935; Strong, 1935, p. 247). It appears also in many Nebraska Aspect sites and sparingly in the Middle Mississippi horizon. Heavier, coarser pottery, similarly cord-roughened, characterizes the limited ceramic collections from numerous unexcavated Woodland sites in nearly all parts of Nebraska and in northern Kansas. Both Upper Republican and Woodland potteries are grit-tempered and belong to the prehistoric period.

Usually, though not always, readily distinguishable from the cord-roughened wares is another paddle-marked pottery in which vessel surfaces have a more or less corrugated appearance. The ridges, 3 to 6 mm. apart, are generally parallel or nearly so, but in some cases they converge or appear to cross one another. They vary in length from 1 to 6 or 8 cm. but are seldom straight or continuously traceable for more than 2 or 3 cm. Sometimes one block of impressions is surrounded by others applied at different angles; or the ridges alternate somewhat from one series to the next so as to give the effect of a plaited fabric. Less common are crisscrossed, herringbone, or chevron patterns. We know of no instances where curvilinear impressions have been found. The markings have usually been rubbed down and partially obliterated, either by design or incidentally through usage, and it is often extremely difficult to determine their exact form.

This type of surface treatment is highly characteristic of the protohistoric and historic pottery of the Pawnee area in east-central Nebraska (pl. 13, *a*, *b*). It has been found at protohistoric village sites in Scott County, Kans., and Chase County, Nebr., which are provisionally assigned to the Dismal River horizon. In Rice, McPherson, and Cowley Counties, Kans., it appears repeatedly on many sherds for which a Wichita origin has been suggested (Wedel, 1942). With it here is a small but consistent proportion of cord-roughened pottery; associated Puebloan sherds have been identified as late Rio Grande glaze wares dating *circa* 1525-1650. Similar markings are found on much of the pottery from the Mandan and Arikara areas in North and South Dakota. In Nebraska and Kansas this type of surface finish appears to be virtually limited to sites and archeological horizons of the contact period. We know of no published record of its occurrence at sites assignable to such prehistoric complexes as the Upper Republican, the Woodland, the Nebraska Aspect, or the

Middle Mississippi. It seems to be generally absent, also, from Oneota pottery, except where it occurs on occasional intrusive grit-tempered sherds probably indicative of trade relations with the contemporary Pawnee.¹

Various suggestions have been made from time to time concerning the instrument or process used to produce these impressions. Holmes (1903, p. 199) was of the opinion that protohistoric Pawnee sherds in the National Museum had been "finished with cord-wrapped or ribbed implements." Wedel (1936, p. 66) characterizes Pawnee pottery as "ridged (paddle-marked ?)." Dunlevy (1936, pp. 173, 188) speaks of the "use of the carved paddle as a universal element in technic" at certain early Pawnee sites. Carlyle S. Smith, in an unpublished manuscript (accompanying letter to Wedel, Dec. 1, 1939) on the Lovitt Site (Dismal River horizon), Chase County, Nebr., states that a minority of the sherds "have the grooved surface such as is found on Pawnee and Mandan pottery. In the opinion of the author the above finish was achieved by the application of a thong-wrapped paddle." For the rather varied markings on Mandan pottery, Will and Spinden (1906, p. 178) suggest "a paddle covered with matting * * * an incised paddle * * *" or "the use of a small spatulate stick." The surfaces of many of these upper Missouri sherds have a "combed" appearance as if a coarsely notched tool had been dragged over the unfired vessels. Concerning protohistoric Wichita (?) pottery from Paint Creek, McPherson County, Kans., Udden (1900, p. 28) observes that many sherds bore shallow indentations "suggesting partly obliterated impressions of some coarse plaited fabric * * * which indicates that the vessels were moulded in some sort of plaited form." Strong (1935, p. 65) also suggests that the ridges on protohistoric Pawnee pottery "may be the result of molding the pots within a willow twig frame as described by Dunbar." Whether Dunbar ever actually saw Pawnee potters using such a frame is not clear, but other than this we know of no statement by a possible eyewitness in the central Great Plains or on the upper Missouri that would help to establish the nature of the tools responsible for the markings. Until recently, moreover, archeologists had recovered no artifacts that were recognized as possibly having been used for the purpose. Certain specimens found in some numbers during the past year or two in Nebraska and Kansas appear to have remedied this lack.

¹ Hill and Wedel, 1936, p. 41. Field notes by the senior author, under date of April 25, 1936, indicate that sherds bearing carved paddle impressions have been found at the Lynch Site in Boyd County, Nebr. On July 19, 1940, through the courtesy of Stan Bartos, a hurried examination was made of the collections from this interesting site, now deposited in the Laboratory for Anthropology, University of Nebraska. It was noted that at least one large restored Oneotalike vessel included paddle-marked body sherds. The affiliations of this site are still unclear (cf. Wedel, 1940, p. 316).

Artifacts of the type in question are by no means new to archeology. Typically, they consist of a section of bison rib bearing a series of subparallel transverse lines cut across one surface—usually the external or convex side (pl. 7, *a*). The lines, 10 to 30 or more in number, are unequally spaced at intervals of 2 to 10 mm. In some specimens lines run into one another or fork; or shorter lines along one edge were carried only part way across the bone. In a few instances there are notches along the edge of the rib, with no cuts on the flat surfaces. In the Great Plains, scored or notched bones other than the rib have not been found in any number, though several specimens made from the large neural spine of the bison are known (pls. 7, *c*; 10, *d*, *g*). Still less common are scored scapulae trimmed to a paddlelike form (pl. 7, *b*).

It has been customary to designate specimens of the type just described as tallies or tally bones, recording devices, musical rasps, or, noncommittally so far as function is concerned, merely as scored bones. Sounding rasps of wood, and apparently also of bone, were known to the Pueblo Indians in recent times (Stevenson, 1883, p. 394; Hodge, 1920, p. 137). The specimen figured by Stevenson (1883, fig. 561) consists of a stick with short notches to which was attached a deer or sheep scapula intended to be drawn across the notches. Hodge (1920, pl. 43) illustrates a number of deer scapulae with short notches on their ridged parts; where these show wear along the ridge he identifies them as sounding rasps. Other pieces lacking signs of wear along the cut part are designated tallies. Only one of the Hawikuh specimens (Hodge, 1920, pl. 44, *e*) has longer lines comparable to the rib implements of the Plains, and here there is no evidence of wear by rasping. At Pecos, Kidder (1932, p. 252) unearthed both notched scapulae similar to the Hawikuh pieces and transversely scored rib fragments of the Plains type. In all these "the notches are greatly abraded by the friction of the rasping stick, and there is little doubt that the specimens served as rattles rather than as tally bones." Rasps of notched sticks were also in common use by tribes of the Plateau region [Spinden, 1908, p. 230 (Nez Percé); Teit, 1930, pp. 164, 278, 386 (Coeur d'Alene, Okanagon, Flathead)].

We have been unable to find any record that the Pawnee, Wichita, or other tribes of the central Great Plains and adjacent Missouri Valley used a musical instrument of this type.² As already suggested, the

² According to Roberts (1936, p. 24, fig. 5), the notched stick or bone rasp without resonator occurred among the Omaha and neighboring plains tribes. No supporting evidence is offered, nor are we able to learn the exact nature of the bone rasps in question. Fletcher and La Flesche (1911, p. 371) do not include the type in their discussion of the musical instruments of the Omaha.

specimens recovered archeologically include no notched scapulae similar to those reported from the Pueblo area. The great majority are of bison rib, and with few exceptions all are characterized by long transverse grooves quite unlike the short deep notches on the wooden rasps of the southwestern area. Some of our excavated pieces show a glossiness along the midline of the scored surface, and in a few instances the cuts at this zone have been partially rubbed or worn away. Conceivably, these were used as sounding rasps. Other specimens—and they are probably at least as numerous—do not exhibit such signs of wear, and for these we suggest a different function.

Laboratory experiments made independently at the United States National Museum and at the Nebraska State Historical Society have shown that many of the scored bone implements, when pressed firmly into plasticine, will leave a ridged or corrugated surface similar to that on Plains pottery as described above. For example, the rib illustrated in plate 7, *a*, produced the surface shown in plate 8, *a*; the paddle-shaped scapula in plate 7, *b*, gave the impressions in plate 8, *c*; and the neural spine in plate 7, *c*, gave the ridging in plate 9, *a*. The markings in plate 9, *a*, as regards prominence, spacing, and form, are virtually identical with those along the lower broken edge of the specimen in plate 9, *b*, a Mandan sherd from North Dakota. Our experiments, though not extended, indicate that the various scored bones available do not give identical impressions. The ridges may be long or short, narrow or broad, prominent or subdued, closely spaced or far apart. Similarly, sherds from different vessels show considerable variation, though the general technique seems to be the same. Some of our bone artifacts leave impressions that are sharper and narrower than those usually noted on sherds, but here it is only necessary to rub the ridged plasticine surface lightly to duplicate the sherd markings.

In their present condition, the implements available to us are too fragile to permit vigorous application. With fresh bones, however, it is believed that the native potters could have worked over their vessel surfaces swiftly and easily. Used paddle fashion, discontinuous corrugations and plaited effects could easily have been attained. The converging lines on some specimens, as for example the paddle in plate 7, *b*, would also give a plaited appearance on a plastic surface.

The rather varied nature of the scored bone artifacts, in regard to size, shape, and the details of scoring, may be judged from plates 10 and 11. With the exception of those in plate 7, *b* and *c*, and that in plate 11, *a*, all are fragmentary, so that their original size is conjectural. Relatively few of our specimens show any such pronounced wear along the midline as would be expected if they had been used for

rasps (cf. pl. 11, *c*). It is difficult, moreover, to see how pieces with so few markings as some of those shown (pl. 7, *b*, *c*) could have been effectively used as musical instruments or to produce rhythmic accompaniments for vocal music. Another alternative, that these objects served as tallies or records, is not very satisfying.

Edge-notched specimens are much less common, but we are able to illustrate several (pl. 12). A broken piece from Rice County, Kans., has 50 notches, some of which have been prolonged part way across one surface of the bone (pl. 12, *a*). The teeth are somewhat worn but not markedly so. The specimens shown in plate 12, *b* and *c*, have coarser notches, which exhibit some wear. In all these examples, the notches are very much closer together than they are on the wooden sounding rasps from the Western United States in the Division of Ethnology, U. S. National Museum. We are inclined to suspect that the Kansas and Nebraska specimens may have been used to comb the surfaces of pottery vessels. Laboratory attempts to produce ridges on plasticine proved only moderately successful, possibly because of the gummy character of the clay.

In view of the generally late occurrence in the Nebraska-Kansas region of pottery with carved paddle impressions, the known facts of distribution concerning scored rib artifacts are of considerable interest. We have found no record of their presence in prehistoric sites identified with the Woodland, Upper Republican, Nebraska Aspect, or Middle Mississippi horizons, and it appears now that they could not be considered a part of the material culture inventory of the peoples responsible for these manifestations. They are also absent from such western Oneota sites as Leary and Fanning. On the other hand, they have been found at Dismal River sites in Scott County, Kans., and Frontier County, Nebr.;³ at several historic and protohistoric Pawnee villages in Nebraska; and at every protohistoric Wichita (?) site in Rice, McPherson, and Cowley Counties, Kans., where the results of excavation are known to us. In other words, scored ribs occur in just those central Great Plains horizons where pottery with carved or ribbed paddle impressions is also present; the two elements appear to have a coterminous occurrence spatially as well as temporally.⁴

Whether a parallel association holds for other areas, such as the northern Great Plains, we are not able to say. On the upper Missouri,

³Not figured in this paper is a specimen from the Dick Site, Frontier County, Nebr. (Wedel, 1935, p. 186), which differs in having the scorings on the concave inner surface instead of on the convex outer face of the rib.

⁴Apart from the possible relationship suggested herein between scored ribs and paddle-marked pottery, it is of interest to note that three rib sounding rasps recovered by Kidder (1932, p. 252) at Pecos came from Glaze III-V levels, i. e., 1475-1700. It seems very unlikely that any of the scored ribs so far recorded from the central Great Plains antedate Glaze III or IV horizons, as dated by Kidder (Kidder and Shepard, 1936, p. 610).

pottery marked with "grooved or thong-wrapped paddles" is attributed by Strong (1940, p. 374) to the Arikara, Mandan, Hidatsa, and Cheyenne, evidently of the protohistoric and historic periods. In the same paper, bone "rasps" are reported only from the Leavenworth (Arikara) Site near Mobridge, S. Dak. (*ibid.*, p. 370), but considerable quantities of bone artifacts are mentioned from several other locations. When full reports appear on these excavations, there will doubtless be a number of additional occurrences for the "rasp." It may be significant that the preliminary account of work at the prehistoric Mitchell Site, in Davison County, S. Dak., makes no mention of corrugated-paddle pottery or of scored bone artifacts (Meleen, 1938).

Willoughby (Hooton and Willoughby, 1920, p. 62) describes a number of scored animal ribs from the Madisonville, Ohio, Site. He, and later Griffin (1935), have termed these musical rasps—with good reason, so far as one may judge from the illustrated material. From the available sources it is not clear whether paddle-marked pottery comparable to that made by the historic plains tribes is also found at Fort Ancient sites.

The association in the Nebraska-Kansas region of scored ribs with pottery bearing impressions from a parallel-ridged paddle seems too close to be accidental. Moreover, the apparent absence of any mention of sounding rasps among the historic aboriginal groups here makes some other explanation necessary for the rasplike objects. If they were indeed used as pottery stamps it is a little curious that so few implements of the kind, relatively speaking, have turned up. Perhaps some perishable substance, such as wood, was employed more commonly than bone. The suggestion by Smith and Strong of a thong wrapped about a stick or bone is also in order, for after a few years underground such a tool would leave no traces readily identified by the archeologist. Since several kinds of devices could have been used, it would probably be oversimplifying the problem to limit the technique to the use of a carved bone. Readily conceding this point, we venture only to suggest that the scored ribs, scapulae, and neural spines repeatedly found in protohistoric and historic sites in the central Great Plains may offer a partial explanation for the ridged or corrugated surfaces on pottery in the associated archeological horizons.

PROVENIENCE AND SIZE OF ARTIFACTS ILLUSTRATED

(In "collector" column, NSHS designates Nebraska State Historical Society; USNM designates U. S. National Museum. Dimensions are given in inches.)

Plate	Marks	Locality		Dimensions		Remarks	Collector
		State	County	Length	Width		
7, a	N4-88-C8.....	Nebraska.....	Nance.....	9¾	1½	Skidi Pawnee village in bottoms southwest of Genoa.	NSHS.
b	N1-GT2-88d.....	do.....	do.....	12¾	3½	Burkett site.....	NSHS.
c	N1-4255A.....	do.....	do.....	11	2½	do.....	NSHS.
8, a	Plasticine impressed with specimen N4-88-C8 (pl. 7, a).						
b	237599.....	North Dakota.....				Rimsherd from the Mandan country.	E. R. Steinbrueck.
c	Plasticine impressed with specimen N1-GT2-88d (pl. 7, b).						
9, a	Plasticine impressed with specimen N1-4255A (pl. 7, c).						
b	237599.....	North Dakota.....				do.....	Do.
10, a	PT1-411-C10.....	Nebraska.....	Nance.....	6¼	1¾	Larson site, east of Genoa.	NSHS.
b	325506-S.D.....	South Dakota.....		8¼	1¾	Vicinity of Mobridge, S. Dak.	USNM.
c	240.....	Kansas.....	Rice.....	13½	1	Mound 17, Tobias site.....	USNM.
d	N1-GT2-F5.....	Nebraska.....	Nance.....	8¾	1½	Burkett site.....	NSHS.
e	325506-S.D.....	South Dakota.....		7½	1	Vicinity of Mobridge, S. Dak.	USNM.
f	KMP1-159-C7.....	Kansas.....	McPherson.....	4¾	¾	Paint Creek site.....	NSHS.
g	N1-pit 4.....	Nebraska.....	Nance.....	3	2¼	Burkett site.....	NSHS.
11, a	355.....	Kansas.....	Rice.....	11½	1¾	Mound 17, Tobias site.....	USNM.
b	N1-1243.....	Nebraska.....	Nance.....	9¾	1¾	Burkett site.....	NSHS.
c	151.....	Kansas.....	Rice.....	8¾	¾	Pit 3, Tobias site.....	USNM.
d	151.....	do.....	do.....	5¾	¾	do.....	USNM.
e	186.....	do.....	do.....	7¾	1	Pit 8, mound 17, Tobias site.	USNM.
f	462.....	Kansas.....	Cowley.....	3¾	1	Pit C, mound 1, Arkansas City Country Club.	USNM.
g	462.....	do.....	do.....	3¾	1	do.....	USNM.
h	465.....	do.....	do.....	6¾	¾	Pit 7, Elliott site.....	USNM.
i	336.....	do.....	Rice.....	4	¾	Mound 17, Tobias site.....	USNM.
12, a	253.....	do.....	do.....	8¼	1	Pit 1A, Thompson site.....	USNM.
b	PT1-360-C8.....	Nebraska.....	Nance.....	8¼	1¾	Larson site, east of Genoa.	NSHS.
c	N1-1077.....	do.....	do.....	7	1½	Burkett site.....	NSHS.
d	N3-461-T3.....	do.....	do.....	6	1½	Wright site.....	NSHS.
e	Bul-589.....	do.....	Butler.....	6¾	¾	Linwood site.....	NSHS.



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THE IDENTITY OF SOME MARINE ANNELID WORMS IN THE UNITED STATES NATIONAL MUSEUM

By OLGA HARTMAN

THIS paper embodies the results of some weeks of study of a portion of the annelid collection of the United States National Museum. I am indebted to the authorities of the Museum and to Dr. Waldo L. Schmitt, curator of the division of marine invertebrates, for making this material and the necessary facilities available to me. I am deeply grateful to the American Association of University Women for a financial grant that made it possible for me to undertake an examination of the types of many specimens of marine annelids of the New World in the United States and abroad.

The list of specimens reported on at this time comprises 50 species, alphabetically listed below and followed by the name herein accepted and the page where my discussion of it appears.

<i>Ammotrypane fimbriata</i> Verrill.....	<i>A. aulogaster</i>	p. 128
<i>Arabella iridescens</i> Treadwell.....	<i>A. iridescens</i>	p. 124
<i>Audouinea oculata</i> Treadwell.....	<i>Cirriformia filigera</i>	p. 127
<i>Branchiomma circumspectum</i> Moore.....	<i>Megalomma circumspectum</i>	p. 133
<i>Cirratulus tenuis</i> Verrill.....	<i>C. grandis</i>	p. 126
<i>Cirratulus tenuis</i> Webster.....	<i>Cirriformia capillaris</i>	p. 128
<i>Eteone trilineata</i> Webster and Benedict....	<i>E. trilineata</i>	p. 113
<i>Eulalia maculosa</i> Webster.....	<i>Eumida sanguinea</i>	p. 112
<i>Eumidia vivida</i> Verrill.....	<i>Eulalia viridis</i>	p. 112
<i>Eupholot acuminata</i> Treadwell.....	<i>Psammolyce flava</i>	p. 108
<i>Eupholot cirrata</i> Treadwell.....	<i>Leanira hystericis</i>	p. 105
<i>Harmopsides natans</i> Chamberlin.....	<i>Lepidasthenia natans</i>	p. 102
<i>Hemipodus mexicanus</i> Chamberlin.....	<i>Glycera mexicana</i>	p. 126

<i>Hypsicomus purpureus</i> Treadwell.....	<i>H. circumspiciens</i>	p. 133
<i>Jasminiera ecaudata</i> Moore.....	<i>Chone ecaudata</i>	p. 135
<i>Laonome punctata</i> Treadwell.....	<i>Sabellastarte indica</i>	p. 132
<i>Laranda robusta</i> Moore.....	<i>Drilonereis robusta</i>	p. 125
<i>Leanira robusta</i> Verrill.....	<i>L. robusta</i>	p. 104
<i>Lumbriconereis acuta</i> Verrill.....	<i>Lumbrineris acuta</i>	p. 114
<i>Lumbriconereis bilabiata</i> Treadwell.....	<i>Lumbrineris bilabiata</i>	p. 120
<i>Lumbriconereis erecta</i>	<i>Lumbrineris erecta</i>	p. 120
<i>Lumbriconereis grandis</i> Treadwell.....	<i>Lumbrineris grandis</i>	p. 114
<i>Lumbriconereis heteropoda</i> Marenzeller....	<i>Lumbrineris heteropoda</i>	p. 121
<i>Lumbriconereis maculata</i> Treadwell.....	<i>Lumbrineris maculata</i>	p. 119
<i>Lumbriconereis minuscula</i> Moore (part)...	<i>Lumbrineris moorei</i> , new spe- cies.....	p. 116
<i>Lumbriconereis minuta</i> Treadwell.....	<i>Lumbrineris minuscula</i>	p. 116
<i>Lumbriconereis parva-pedata</i> Treadwell...	<i>Lumbrineris parva-pedata</i>	p. 118
<i>Lumbriconereis tenuis</i> Verrill (part).....	<i>Arabella tricolor</i>	p. 124
<i>Lumbriconereis zonata</i> Johnson.....	<i>Lumbrineris zonata</i>	p. 123
<i>Lumbrineris elongata</i> Treadwell.....	<i>Lumbrineris parva-pedata</i>	p. 118
<i>Maldane filifera</i> Verrill.....	<i>Petaloproctus filifer</i>	p. 131
<i>Nephtys circinata</i> Verrill.....	<i>Nephtys macroura</i>	p. 113
<i>Notaulax mucronata</i> Moore.....	<i>Potamethus mucronatus</i>	p. 134
<i>Notocirrus zonata</i> Moore.....	<i>Arabella zonata</i>	p. 125
<i>Ophelia denticulata</i> Verrill.....	<i>Ophelia limacina</i>	p. 130
<i>Ophelina agilis</i> Andrews.....	<i>Armandia agilis</i>	p. 129
<i>Ophelina maculata</i> Webster.....	<i>Armandia maculata</i>	p. 129
<i>Phyllodoce arenae</i> Webster.....	<i>Anaitides catenula</i>	p. 109
<i>Phyllodoce catenula</i> Verrill.....	<i>Anaitides catenula</i>	p. 109
<i>Phyllodoce fragilis</i> Webster.....	<i>P. fragilis</i>	p. 111
<i>Phyllodoce magnaoculata</i> Treadwell.....	<i>P. magnaoculata</i>	p. 110
<i>Polynoë alba</i> Treadwell.....	<i>Lepidasthenia alba</i>	p. 103
<i>Polynoë lucida</i> Treadwell.....	<i>Lepidasthenia alba</i>	p. 103
<i>Potamilla californica</i> Treadwell.....	<i>Hypsicomus</i> sp.....	p. 133
<i>Potamilla elongata</i> Treadwell.....	<i>Potamethus elongatus</i>	p. 134
<i>Praxillura ornata</i> Verrill.....	<i>P. ornata</i>	p. 131
<i>Rhodine bitorquata</i> Moore.....	<i>R. bitorquata</i>	p. 132
<i>Sabella picta</i> Verrill.....	<i>Chone infundibuliformis</i>	p. 136
<i>Sthenelais grubei</i> Treadwell.....	<i>Leanira grubei</i>	p. 106
<i>Sthenelais tertiaglabra</i> Moore.....	<i>S. articulata</i>	p. 107

Family POLYNOIDAE

Genus LEPIDASTHENIA Malmgren

LEPIDASTHENIA NATANS (Chamberlin)

Harmopsides natans CHAMBERLIN, 1919, p. 48 (U.S.N.M. No. 19718; off Peru).

There are numerous immature, more or less translucent specimens from Peru, Central America, and west toward Easter Island. The number of segments varies from 20 to 44. The largest (type) is in two pieces, an anterior end of 17 setigers and a posterior one of 27 setigers, representing perhaps an entire individual; if complete, ely-

trophores occur on segments 2, 4, 5, 7, 9 * * * 23, 26, 29, 32, 34, 37, 40, 43, a total of 19 pairs. All elytra except the last have been lost; they are tiny, nearly circular, translucent white, with entire margin.

The first segment is provided with long dorsal and ventral cirri; the former extend forward about as far as the long palpi; the ventrals are somewhat shorter. In addition to a stout, pointed aciculum, two (or 3 or 4) stout, blunt, yellow setae project from the parapodium. The second segment has a slender, tapering, notoacicular lobe but no setae; this is typical of more posterior parapodia. The neuropodium has a long, triangular, presetal lobe, from which the aciculum extends, and a very much shorter, postsetal lobe. Neuropodia on segments 4 to 14 have a unique modification consisting of an expanded, glandular area ventral to the triangular acicular lobe; it extends to the ventral face of the parapodium. This structure is large, conspicuous on segments 4 to 8 and gradually diminishes in size to the fourteenth segment. Dorsal cirri are long throughout, extending far beyond the parapodial lobes, but are shorter than the longest setae. Ventral cirri are slender, tapering, and inserted near the place where the ventralmost setae emerge.

Neurosetae are of two intergrading kinds, including (1) more numerous long, slender setae with many relatively coarse, widely spaced teeth on the outer side, tapering distally and ending in a fine, bifid tip, and (2) 7 or 8 shorter, coarser, inferior setae with a shorter serrated region, and ending in a coarser bifid tip. In these respects it agrees with *L. maculata* Potts (1910, p. 344) originally described from Zanzibar.

The monotypic genus, *Harmopsides* Chamberlin, was originally separated from *Lepidasthenia* because it was thought to have fewer elytra; since, however, the collection consists of only immature individuals, this character has no real significance. Monroe (1937, p. 262) suggested that this might represent a juvenile stage of *L. maculata* Potts. In the latter, however, no mention has been made of glandular areas on segments 4 to 14, such as are present in *L. natans*. In other respects they agree rather well.

LEPIDASTHENIA ALBA (Treadwell)

Polynoë alba TREADWELL, 1906, p. 1149 (U.S.N.M. No. 5201; Honolulu).

Polynoë lucida TREADWELL, 1906, p. 1150 (U.S.N.M. No. 5202; off Hawaii).

Lepidasthenia alba HARTMAN, 1938a, p. 114.

I have again examined the types of *P. alba* and *P. lucida* and must conclude that they represent the same species. Earlier (1938a, p. 114) I referred them both to *Lepidasthenia* but separated them on the proportionate lengths of parapodia and the relative lengths

of their free parts. Both of these characters are perhaps the result of accidental fixation. Their resemblances to each other are far more striking. Both have the same well-rounded, nuchal lobe covering the posterior part of the prostomium; the first segment lacks projecting setae or acicula; in both setal structures and prostomial parts are identical. Both have beadlike rows of small papillations, disposed transversely across the dorsum of the first few segments, most numerous over the dorsal bases of the parapodia. Both have similar papillations across the ventrum between the base of the ventral cirri and the body wall. A similar condition has been described for *L. longicirrata* Berkeley (1923, p. 214). The notopodium is represented only by a short, papillar lobe. The ventral cirrus is inserted on the proximal half of the neuropodial base. Superior and inferior neurosetae resemble one another; the serrated region is short. Nephridial papillae are short and inconspicuous.

L. alba is known only from Hawaii.

Family SIGALIONIDAE

Genus *LEANIRA* Kinberg

LEANIRA ROBUSTA Verrill

FIGURE 8, *a*

Leanira robusta VERRILL, 1881, pl. 14, fig. 10 [fig. only]; 1885a, p. 426; 1885b, pl. 40, fig. 175 [fig. only] (U.S.N.M. No. 10320; off Newport, Rhode Island).

The prostomium is trapezoidal, about one and one-half times as wide as long. There are four eye spots, weakly visible, deeply embedded in the anterior half of the lobe. The median antennal base lacks ctenidia. Its appendage is short, less than the prostomial length. Paired prostomial antennae are about as large, inserted on the dorsal base of the first setiger. The first parapodium is directed forward, most of it lying ventral to the prostomium; it is both shorter and smaller than the second, which is also directed forward. The first setiger has a ventral cirrus less than half as large as the dorsal cirrus and two or three slender, cirriform fringes inserted between the dorsal cirrus and the dorsal paired prostomial antennae. The third segment is well developed, not at all fused with the preceding segment; it is plain dorsally, without either cirrus or elyrophore. Throughout, both branches of parapodia have conspicuous fringing papillae on both anterior and posterior faces.

Elytra are smooth, white, with entire margin, without fringe or papillae, but from the third with a lateral incision (fig. 8, *a*). The first pair is small, subcircular, leaving exposed the prostomial appendages and the first and second parapodial lobes; they overlap one another only slightly in the median line. From the twenty-seventh

segment elytra occur on all segments. Elytral cirri have ctenidia on their ventral face, but parapodia lack them.

Simple spinose setae are present from at least the twentieth segment to the end, but nowhere conspicuous. In more anterior segments their presence could not be verified because many of the setae have been broken off. Larger neurosetae are composite, with canaliculate, pointed appendage; the shaft is smooth and straight. All composite setae in a parapodium resemble one another except that ventrally they are much finer.

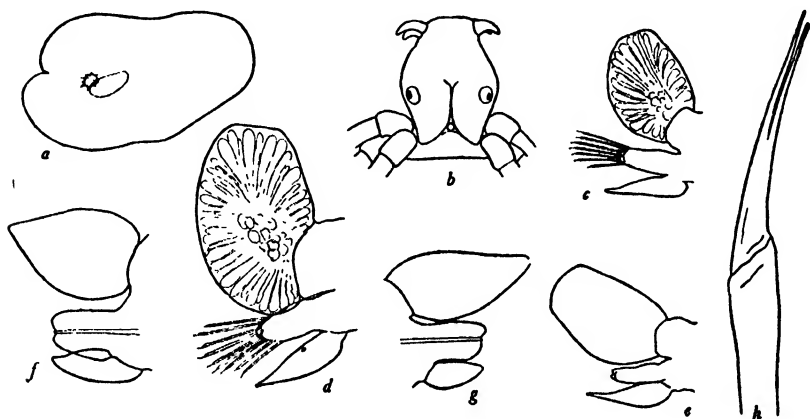


FIGURE 8.—Species of *LEANIRA*, *ANAITIDES*, *EUMIDA*, and *PSAMMOLYCE* (enlarged)

- a, *Leanira robusta* (U.S.N.M. No. 10320): Elytrum from seventh segment; incised edge marks outer lateral margin.
 b-e, *Anaitides catenula*: b, Anterior end in dorsal view; c, a far posterior parapodium; d, an anteromedian parapodium from widest region of body (U.S.N.M. No. 10153); e, a posterior parapodium (U.S.N.M. No. 481).
 f, g, *Eumida sanguinea* (U.S.N.M. No. 493): f, Outline of median parapodium; g, outline of posterior parapodium.
 h, *Psammolyce flava* (U.S.N.M. No. 20032): A composite neuropodial seta.

The ventral surface of the body is smooth; ventral cirri are simple, cirriform. *L. robusta* is unique in having laterally incised elytra. It is known only from off Marthas Vineyard, Mass., in 100–126 fathoms.

LEANIRA HYSTRICIS Ehlers

Leanira hystricis EHLERS, 1875, p. 35; McINTOSH, 1900, p. 434.

Eupholoë cirrata TREADWELL, 1934, p. 5 (U.S.N.M. No. 20033; north of Puerto Rico, in 260 fathoms.)

In the type of *Eupholoë cirrata* the prostomium is rounded, wider than long, without a median sulcus but with a depression where the median antenna is inserted. Its median antenna has a short base, without ctenidium. Eyes are lacking. The paired antennae are

inserted on the first segment, near the inner bases of the setal fascicles. Dorsal cirri are probably absent from all except the first segment. Parapodia are biramous, the fringing papillae especially long and numerous on notopodia throughout; they are present also on neuropodia but shorter and fewer. There are two small ctenidia on parapodia, one posterior to the insertion of the elytra, another at the posterodorsal face of the notopodium; they are largest on anterior segments and gradually get smaller and are not visible on posterior segments.

Elytra are smooth, white, oval, with entire margin; those of a pair meet one another in the median line or are slightly overlapping. Elytral cirri are simple, cirriform, attached to the elyrophore, first present as a minute lobe on about the twenty-first segment, increasing in size more posteriorly. Notosetae are simple, slender; most are spinous along their free edge, some others are almost, or quite, smooth. Neurosetae are composite, the appendage canaliculate, terminating in a pointed tip.

Eupholoë McIntosh (1885, p. 157) was originally defined as having elytra provided with lateral processes (much as in *Psammolyce*) and neurosetae distally falcate with a minute secondary tooth. *E. cirrata* has smooth elytra with entire margin, and canaliculate, pointed neurosetae, hence cannot be *Eupholoë*. It does not seem to be distinguishable from *Leanira hystericis* Ehlers. The latter was first described west off England and has since been reported in other parts of the Gulf Stream. It is a deep-water form.

LEANIRA GRUBEI (Treadwell)

Sthenelais grubei TREADWELL, 1902, p. 187 (U.S.N.M. No. 15906; Mayaguez Harbor, Puerto Rico, in 12-18 fathoms).

The prostomium is trapezoidal, with four eyes, the anterior ventral pair slightly visible in dorsal view, the posterior pair elongate oval, on the anterior third of the lobe. The median antenna is inserted on a stout ceratophore with auricular paired ctenidia at its base; its cirrus extends distally about as far as the setae of the first segment. The paired antennae are inserted on the first setiger; they are clavate in shape, constricted subapically and terminating in an elongate knob; they are about one-third as long as the style of the median antenna. The first setiger has long, slender dorsal cirri and similar, though shorter (less than half as long), ventral cirri; its setae are fine, simple, numerous. The second and third segments are more or less fused on the dorsal side, as typical of *Leanira*; first elytra arise from the second segment. The third segment has neither elytra nor dorsal cirrus but a small branchial rudiment. Simple, spinulose setae are present from the third, numbering only three to five in a fascicle.

The first elytra are broadly ellipsoid in outline, imbricated medially; the margin is smooth except for a sparse fringe of short papillae. The second and third elytra are deeply excavate at their anterior edge and have a few short papillae at the outer margin. The fourth has a nearly straight, anterior margin and the lateral papillae a little longer. More posteriorly the elytra increase in size somewhat, are longer than wide, their anterior edge very slightly excavate, their outer lateral edge with a few slender fringes in a single row.

Notosetae are simple, delicately transversely serrated. Neuropodia have three or four superior, simple, spinose setae, more numerous, stouter, composite setae in the circumaciclar fascicle, and similar, though slenderer, setae in the linear series. Composite setae have a shaft that is slightly thickened distally, with a few coarse spines but no transverse serrations; the appendage is long and slender, tapering to a fine point, without canaliculae. There are no falcigerous, composite setae, and none with bifid tip, such as characterize the genus *Sthenelais*; they differ from typical setae of *Leamira* only in that the appendage is not canaliculate.

Neuropodia of typical parapodia lack parapodial fringe except for two or three at the dorsal edge. Notopodia have a few longer papillae at the dorsoanterior distal edge. The ventral surface of the body is quite smooth; ventral cirri lack accessory fringe. Segments three to eight have a small clavate papilla on the ventral face of the parapodium, a short distance from its origin at the body wall. This species is referred to *Leamira* because the composite setae terminate distally in a point; falcigerous setae are lacking, and segments two and three are more or less fused dorsally.

Genus *STHENELAIS* Kinberg

STHENELAIS ARTICULATA Kinberg

Sthenelais articulata KINBERG, 1855, p. 387; 1910, p. 28.

Sthenelais tertiaglabra MOORE, 1910, p. 395 (U.S.N.M. No. 17108; southern California).

Sthenelais hancocki HARTMAN, 1939, p. 65.

The first parapodium is about as long as the second but somewhat stouter and directed straight forward. Its base is proportionately long. In addition to a long dorsal cirrus and a shorter ventral cirrus, it has paired prostomial antennae, inserted near the inner dorsal base of the superiormost setae, about two-thirds as long as the ventral cirrus, terminating in a small, elongate knob. Segments three to five have a small, clavate, accessory, ventral cirrus, inserted about midway between the main ventral cirrus and the body wall. The ventral surface is smooth. Parapodial lobes practically lack fringing papillae except in the first few segments, where they are

present at the distal ends of both podal lobes but not conspicuous. Simple spinose setae are present from the third setiger, numbering three to five in a parapodium, but nowhere conspicuous. The appendage of heavier neuropodial setae tapers distally and terminates in a very fine, though distinctly bifid, tip, canaliculate along its length. There are one or two coarser setae with simple appendage, the tip bifid, the accessory tooth long, sheathlike. Elytra are translucent, with fringe on the outer margin, in a single row. Elytral spines are triangular, conical.

The identity of *S. articulata* Kinberg, from Rio de Janeiro, with *S. tertiaglabra* and *S. hancocki* (both from southern California) was not suspected until the type of the first was reexamined. This was made possible through the courtesy of Prof. Sixten Bock, of the Swedish State Museum. The characteristic neuropodial setae and conical elytral spines are unique features of this species.

Genus PSAMMOLYCE Kinberg

PSAMMOLYCE FLAVA Kinberg

FIGURE 8, h

Psammolyce flava KINBERG, 1855, p. 388; 1910, p. 31.

Eupholis acuminata TREADWELL, 1934, p. 3 (U.S.N.M. No. 20032; off Puerto Rico).

The prostomium has a stout median antenna and four minute eye spots embedded in the anterior frontal portion of the lobe. The paired ventral eyes are larger but can be seen only by pushing aside the median antennal base. Paired antennae are tiny, inconspicuous, and inserted near the inner bases of the first setiger. The median antenna is long and slender and extends distally as far as the setae of the first segment but is surpassed by the long, smooth palpi.

Parapodia are biramous, with conspicuous, flangelike ctenidia on the dorsal face of notopodia. The third segment has a slender, short cirrophore and a short elytral cirrus immediately ventral to it. A style is no more present. Elytral cirri are present from the second segment, on the outer base of the elyrophore.

Elytra are subovate, without lateral processes, but with fringe on all except the anterior margin; most of the dorsal surface is encrusted with fine white sand or shell particles, except where overlain by the preceding elytrum. Notosetae are slender, in full spreading fascicles, delicately spinous. Neurosetae are much coarser, fewer; all resemble one another except that the ventralmost are smaller and finer. They have an oblique, articulating surface; the appendage terminates in a tapering tip in which the distal end is bifurcated for a distance nearly half the length of the appendage (fig. 8, h). This condition is seemingly natural, not a result of breakage, since it has been observed on all neurosetae that were carefully examined. The shaft is nearly

smooth. In far anterior segments the neurosetae have a longer appendage, the shaft is similar or somewhat roughened.

The middorsal portions of the body segments, between the dorsal parapodial bases, have three stalked, clavate papillae in a transverse row, to which foreign particles adhere.

Another specimen labeled "*Eupholoe acuminata*" comes from latitude 18°30'30" N., longitude 66°23'5" W., in only 40 fathoms. This is also a *Psammolyce* but differs from the preceding and is believed to represent perhaps an undescribed form. Its elytra have conspicuous inner processes, consisting typically of a larger, subcircular lobe at the inner, anterior edge, and three much smaller, elongate lobes along the posterior margin of the elytrum. The four prostomial eyes are dark and conspicuous, the ventral pair being at the sides of the prostomium, readily seen in lateral and frontal views; the dorsal pair are at the sides of the median antennal base. The median antennal style is long and slender but surpassed in length by the setae of the first segment. Paired antennae are inserted on the first setiger, the style about one-third as long as that of the median style. Neurosetae are stout, the shaft transversely serrated, the appendage thick, falcate, the tip entire, blunt, slightly recurved. The same species is represented in the National collections by another specimen labeled "*Ps. ridiga*. No. 15954. *Fish Hawk* Sta. 6062. Mayaguez Harbor, in 25-30 fms."

Eupholoe acuminata must be referred to *P. flava* Kinberg with which it agrees fully.

Family PHYLLODOCIDAE

Genus ANAITIDES Czerniawsky

ANAITIDES CATENULA (Verrill)

FIGURE 8, b-e

Phyllodoce catenula VERRILL, 1873, p. 587 (U.S.N.M. No. 10153; Vineyard Sound, Mass.) ; 1874, p. 39.

Phyllodoce arenae WEBSTER, 1879, p. 105 (U.S.N.M. No. 481; New Jersey).

There is a single specimen, labeled *Phyllodoce catenula*, with proboscis withdrawn; it is so coiled and twisted that its length is not easily determinable. The proportions are about as stated by Verrill (75 mm. long, 1.5 mm. wide) ; hence this is a moderately long, slender species. The prostomial lobe is longer than broad, widest near its middle (fig. 8, b) just anterior to the two large, dark eyes; the posterior margin is cleft, with a nuchal papilla that is somewhat concealed by the overhanging lobes. The first segment is dorsally reduced, the second and third segments are free from one another.

Tentacular cirri are long, slender, tapering; the longest reaches back to the eighth or ninth segment.

Dorsal cirri are broad, foliaceous, somewhat imbricated; ventral cirri are elongate, prolonged in a slender tip (fig. 8, *c, d*). The setal lobe is long and distally incised and does not extend laterally so far as the ventral cirri. Setae have shafts that terminate in a finely spinose end, without a major tooth; the appendage tapers and is slender and rather short.

This has been compared with the type specimens (2) of *Phyllodoce arenae* Webster. They agree closely in all details except one. Prostomial proportions are identical, the setal lobe is prolonged laterally, ventral cirri are long, pointed, extending distally beyond the setal lobe (fig. 8, *e*). Dorsal cirri have the same shape and texture, but in Webster's specimens there is a longitudinal ridge (not now so pronounced as was originally shown) near the upper margin of the dorsal cirrus, and the glandular striations are less conspicuous. In both, the proboscis was originally described with longitudinal series of conical papillae, hence belong to *Anaitides*.

A. catenula (believed to include *P. arenae*) is characterized as follows: (1) The prostomium is incised at its posterior margin, provided with a nuchal papilla, (2) ventral cirri are long, taper to slender points, extend laterally beyond the setal lobe, (3) dorsal cirri are foliaceous, longer than broad, distally subtruncate, and (4) the proboscis has 12 rows of papillae on the basal portion.

Genus PHYLLODOCE Savigny

PHYLLODOCE MAGNAOCULATA Treadwell

FIGURE 9, *c, d*

Phyllodoce magnaoculata TREADWELL, 1902, p. 191 (U.S.N.M. No. 15951; Puerto Rico).

In the unique type the eyes are now completely faded; the proboscis is not everted. There is no indication of a nuchal papilla; the posterior border of the prostomium is straight, hence not as Augener (1934, p. 127) has described for *Anaitides benedeni* (Hansen). The peristomial cirri are thick, clavate, subequal in length, two or three times as long as the prostomium. Dorsal cirri are broadly rounded, much wider than long, with a dark spot near the outer ectal margin (fig. 9, *c, d*). Setae number about 18 in a fascicle in posterior fourth of the body. They have a slender, sickle-like appendage; the shaft is distally somewhat thickened but appears quite smooth. Ventral cirri resemble the dorsal cirri but are smaller (fig. 9, *d*).

This was incorrectly referred to *Anaitides benedeni* (Hansen) (Augener, 1934, p. 128). The latter was said to have a "herzformige

hinten ausgerandete Kopf," hence not as in *P. magnaoculata*; also the dorsal and ventral cirri are otherwise.

PHYLLODOCE FRAGILIS Webster

Phyllodoce fragilis WEBSTER, 1879, p. 214 (U.S.N.M. No. 535; Virginia).—ANDREWS, 1891, p. 281.

The type vial contains about seven specimens. The body is elongate and tapers gradually toward both ends to filamentous proportions; thus, the structures of the head and proboscis are extremely difficult

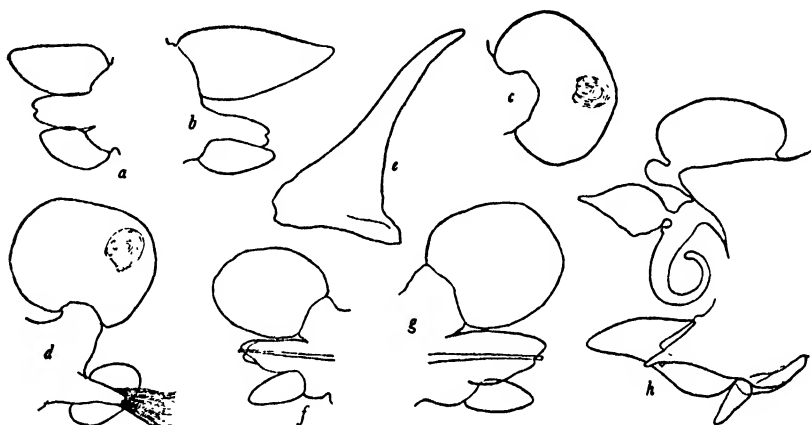


FIGURE 9.—Species of EULALIA, PHYLLODOCE, GLYCERA, ETEONE, and NEPHTYS (enlarged)

- a, b, *Eulalia viridis* (U.S.N.M. No. 10159): a, Outline of eighth parapodium; b, outline of a posterior parapodium.
 c, d, *Phyllodoce magnaoculata* (U.S.N.M. No. 15951): c, Dorsal cirrus from a median segment; d, parapodium from posterior fourth of body.
 e, *Glycera mexicana* (U.S.N.M. No. 19372): Aileron from jaw piece.
 f, g, *Eteone trilineata* (U.S.N.M. No. 441): f, Outline of a posterior parapodium; g, outline of a median parapodium.
 h, *Nephtys macroura* (U.S.N.M. No. 15882): Outline of a median parapodium, the two rami separated from one another.

to distinguish. The prostomium is small, suboval, with straight posterior margin, without nuchal or median papilla. The two eyes are large and dark. The first segment is dorsally reduced and has a pair of clavate cirri; the second segment is a complete ring, with dorsal and ventral cirri resembling those of the first, but a little larger. The third segment has clavate cirri dorsally and short, flat ventral cirri. The formula of the first three segments follows:

(lc=long cirrus, sc=short cirrus, S=setae): $lc + S \frac{lc}{lc} + S \frac{lc}{sc}$. From the fourth segment dorsal cirri are broad, thin, foliaceous, about twice

as long as wide, and distally rounded, though asymmetrical. They increase rapidly in width posteriorly and are broadly imbricated.

This species was collected many times by the author in oyster clusters at Beaufort, N. C. In life it is bright green; it is gregarious, with a tendency to mass together in interstices of oyster clumps. In spite of numerous attempts to incite the protrusion of the proboscis in life, no success was obtained. Examinations of dissections revealed only a slender, wrinkled tube.

Genus *EUMIDA* Malmgren

EUMIDA SANGUINEA (Ørsted)

FIGURE 8, *f*, *g*

Eulalia sanguinea ØRSTED, 1843, p. 28, figs. 80, 82.

Eulalia maculosa WEBSTER, 1879, p. 215 (U. S. N. M. No. 493; Great Egg Harbor, N. J.).

In the type of *Eulalia maculosa* the proboscis is smooth; hence this is a *Eumida*. It terminates distally in 17 soft papillae. The median prostomial antenna is inserted a short distance anterior to the large, dark, paired eyes. The longest tentacular cirri extend posteriorly to about the tenth setiger. Dorsal cirri are thin, foliaceous, longer than broad, but increase in length posteriorly; these parts are shown in figure 8, *f*, *g*, for median and posterior parapodia.

This agrees well with the widely known *E. sanguinea*, already reported from many parts of the north Atlantic and Pacific.

Genus *EULALIA* Savigny

EULALIA VIRIDIS (O. F. Müller)

FIGURE 9, *a*, *b*

Nereis viridis MÜLLER, 1776, p. 156.

Eumidia vivida VERRILL, 1873, p. 584 (U.S.N.M. No. 10159; Vineyard Sound, Mass.).

Eulalia viridis FAUVEL, 1923, p. 160.

The type collection of *Eumidia vivida* includes about 12 specimens. The everted proboscis is cylindrical, covered over its entire length with irregularly dispersed papillae or forming seven or eight irregular, longitudinal rows. The first tentacular segment is dorsally entire, as typical of the genus *Eulalia*. The median prostomial antenna is inserted a short distance anterior to the eyes. Dorsal and ventral cirri and parapodial lobes have the proportions shown in figure 9, *a*, *b*. These are typical representatives of *Eulalia viridis* (O. F. Müller).

Genus ETEONE Savigny

ETEONE TRILINEATA Webster and Benedict

FIGURE 9, *f*, *g*

Eteone trilineata WEBSTER and BENEDICT, 1887, p. 712 (U.S.N.M. No. 441; Eastport, Maine).

The prostomium is trapezoidal in outline, with a broad, shallow, median sulcus throughout its length. Dorsal cirri are thick, broadly rounded, as broad as long in median segments (fig. 9, *g*), somewhat longer than broad in posterior segments (fig. 9, *f*). Ventral cirri are longer than wide but never extend distally beyond the setigerous lobe; the superior acicular lobe exceeds in length the inferior acicular one. The two anal cirri are long, thick, about as originally shown. The setal shaft has a long tooth on one side and a shorter on the other. The specific name refers to three longitudinal color bands dorsally, consisting of a narrow median and a pair of broad, lateral ones.

E. trilineata inhabits sandy mud or shelly bottoms, in the low intertidal zones or somewhat below.

Family NEPHTYIDAE

Genus NEPHTYS Cuvier

NEPHTYS MACROURA Schmarda

FIGURE 9, *h*

Nephtys macroura SCHMARDA, 1861, p. 91.

Nephtys circinata VERRILL, 1874, p. 38 (U.S.N.M. No. 15882; St. Georges Bank, Maine, in 85 fathoms).

The recurved cirri are involute, present from the third setiger, continued nearly to the posterior end; the last five or six segments lack them. The postacicular setae are long, silky, flowing, with few or no denticulations; preacicular setae are finer, barred. No lyre setae have been observed. A typical parapodium is shown in figure 9, *h*.

The resemblance between this and *N. macroura* Schmarda (1861, p. 91) is sufficiently striking to suggest identity. Both have involute cirri, and the lobes on notopodia and neuropodia are the same except that *N. circinata* has a more pronounced supraacicular neuropodial lobe. *N. macroura* was originally described from New Zealand, but since it has been widely reported from southern and eastern South America as *N. praetiosa* Kinberg (1865, p. 239), from La Plata as *N. virginis* Kinberg (1866, p. 239), from southeastern South America, and as *N. lutrea* Baird (1873, p. 95) from Patagonia. A subspecies, *peruana* Hartman (1940, p. 236), has been described

from Peru in 10-40 fathoms. *N. circinata* is herein referred to *N. macroura*; it represents the first record of its distribution north of the equator.

Other collections deposited in the Museum originate from "Massachusetts Bay, Sept. 21, 1878. Sta. 221. 37-38 fms." and "Bay of Fundy, 1872. 6022."

Family LUMBRINERIDAE

Genus LUMBRINERIS Blainville

LUMBRINERIS ACUTA (Verrill)

FIGURE 10, *a-d*

Lumbriconereis acuta VERRILL, 1875, p. 39; 1882, p. 314 (U.S.N.M. No. 13392; off Block Island, R. I.).

This is a slender, greatly attenuate form, about 30-40 mm. long. The most conspicuous feature is the greatly elongated, slightly depressed, prostomial lobe (fig. 10, *a*); eyes are lacking. The peristomial ring is faintly biannulate. Segments are well marked, smooth, uniannulate; they are about as long as wide, or only half that long. The maxillary apparatus has carriers that are proportionately enormous and approximately triangular in outline. Forceps are robust, with two blunt teeth; maxilla II has three blunt teeth; maxilla III has a single tooth; maxilla IV has one tooth (fig. 10, *c*). Mandibles are about as long as the maxillary apparatus; the bases are slender, the anterior end flaring.

Parapodia are short, inconspicuous in the anterior region, with short simple lobes; posteriorly the postsetal lobe elongates slightly but is nowhere markedly developed. Setae are simple only; in anterior segments the bilimbate setae have wings that are rather broad (fig. 10, *b*). Hooded hooks are present in median segments, accompanied with some limbate setae; these have a short, hooded area with obscure denticulations distally (fig. 10, *d*).

In its peculiarly elongated prostomium *L. acuta* greatly resembles *L. mucronata* Ehlers (1912, pl. 12, fig. 10) from the mouth of the Congo River. In this, however, the distal ends of the hooded hooks are markedly bidentate; also, the maxillary apparatus is otherwise.

L. acuta is known only from New England.

LUMBRINERIS GRANDIS (Treadwell)

FIGURE 10, *h, k, l*

Lumbriconereis grandis TREADWELL, 1906, p. 1170 (U.S.N.M. No. 5214; Hawaii).

There is a single specimen in three pieces, lacking a posterior end. The prostomial lobe is thick, conical, about as long as wide. Many of the anterior setae are broken away, but a seventh parapodium

has composite setae with a long, slender appendage (fig. 10, *l*). Composite setae are continued through at least 26 segments in the last of which there are at least three limbate setae, two composite hooks, and three simple hooded hooks. The appendage of the composite hooks decreases in length posteriorly so that its length comes to be only about three times its width. More posteriorly (after the twenty-sixth segment) composite setae are gradually more or less completely replaced by simple hooks. Limbate setae may be absent after the sixtieth segment; none were observed after that.

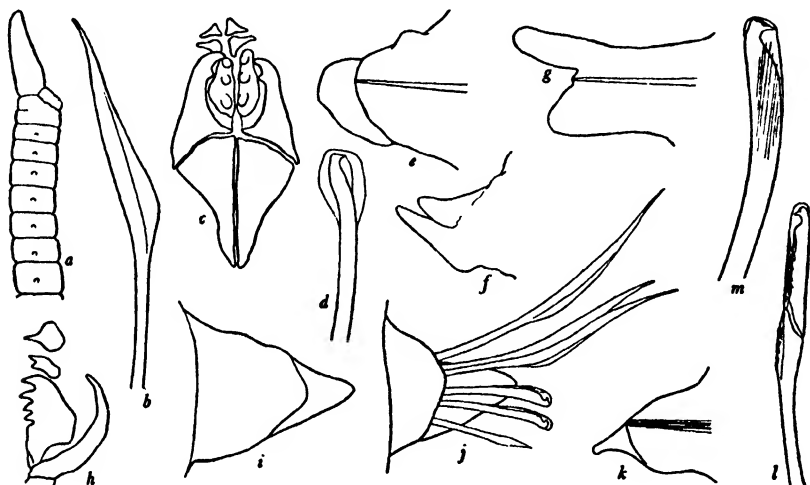


FIGURE 10.—Species of *LUMBRINERIS* (enlarged)

- a-d*, *Lumbrineris acuta* (U.S.N.M. No. 12882): *a*, Anterior end from left side; *b*, bilimbate seta from third parapodium; *c*, maxillary parts; *d*, hooded hook from a median-posterior parapodium.
- e-g*, *Lumbrineris heteropoda* (Honshu, Japan): *e*, Tenth parapodium; *f*, a median parapodium; *g*, a posterior parapodium.
- h, k, l*, *Lumbrineris grandis* (U.S.N.M. No. 5214): *h*, Maxillary parts from one side; *k*, outline of an anterior parapodium; *l*, composite seta seventh parapodium.
- i, j, m*, *Lumbrineris parva-pedata*: *i*, Outline of an anterior parapodium (U.S.N.M. No. 16019); *j*, fifth parapodium in anterior view (U.S.N.M. No. 19622); *m*, hooded hook from a median segment (U.S.N.M. No. 16019).

In this specimen the third maxillary plate on both right and left sides is clearly bifid (fig. 10, *h*); the forceps are distinctly falcate. Parapodia are short, thick throughout; the postsetal lobe exceeds the presetal one. The latter are simply low, rounded, cushionlike or compressed; postsetal lobes are more or less acutely pointed, their length, however, no greater than their width (fig. 10, *k*).

L. grandis has affinities with *L. japonica* Marenzeller in having composite setae in anterior segments, and maxillary parts are similar. In *L. grandis*, however, the parapodial lobes are much reduced

throughout. It differs also from *L. minuscula*, from Hawaii (see below), in having smaller, slenderer proportions, and the anterior parapodial lobes are here acutely pointed, not rounded.

LUMBRINERIS MINUSCULA Moore

FIGURE 12, *e, f*

Lumbriconereis minuta TREADWELL, 1906, p. 1171 (U.S.N.M. No. 5215; off Hawaii).

Lumbrineris minuscula MOORE, 1911, p. 294.

A single fragment of 87 segments measures 20 mm. long. The head and some anterior segments (perhaps only a few), also the proboscideal armature, are missing. The first 16 segments on this piece are provided with limbate setae and composite hooks (fig. 12, *e*); in the next segments there are, in addition to superior and inferior limbate setae, two composite hooks (fig. 12, *f*) and one simple hook. More posteriorly only simple hooks and limbate setae are present. A posterior end of indeterminable length is missing, but the last segments present have a few (one or two) delicate limbate setae and several (3 or 4) hooded hooks. The maxillary apparatus (now missing) was illustrated by a figure that does not bring out the details; maxilla II was described with five teeth right and four left; the other maxillary plates are not distinguishable. The setae, originally thought to be of only two kinds, are actually of three kinds, composite hooks, simple hooks, and limbate setae. This error led Moore (1911, p. 294) to attribute some specimens from Catalina Island to this species (see below).

L. minuscula Moore (1911, p. 294) was proposed to replace *L. minuta* Treadwell (not Théel). In addition, a description was given for specimens from Catalina Island, which differ from the type of *L. minuscula* in several important respects and for which the new name *L. moorei* (see below) is proposed.

L. minuscula has affinities with *L. japonica* Marenzeller; both have composite setae in anterior segments. In *L. minuscula* limbate setae are present through at least 80 segments, in *L. japonica* they are absent after about 34 segments; in *L. minuscula* anterior parapodia have a broadly rounded, auricular postsetal lobe (fig. 12, *e*), in *L. japonica* this lobe is compressed, conical.

LUMBRINERIS MOOREI, new species

FIGURE 12, *a, b, g*

Lumbriconereis minuscula MOORE, 1911, p. 294 (in part) (U.S.N.M. No. 17403; off Catalina Island, in 1,350-2,182 fathoms).

There are two fragmentary specimens, differing greatly from the type of *L. minuscula* (see above) with which these were at first com-

pared. Moore (1911, pp. 294-295) has already given a lucid description, which agrees well with these individuals. The maxillary carriers are about as long as broad, with a lateral constriction at about the middle, the free ends are broadly rounded. Forceps are falcate; maxilla II has five left teeth, 4 right; maxilla III has one broad, blunt tooth on each side; maxilla IV has a single point on each side. The mandibles are now very thin, translucent (the calcareous parts probably dissolved away); the anterior end is flaring, the posterior ends slender, the two parts widely separated for more than one-third the total length.

The distribution of setae is as first described; figure 12, *a*, shows the greatly elongate limbate area of the pointed setae in anterior segments; hooded hooks are simple, with minutely denticulate distal end (fig. 12, *g*); in postmedian segments they are accompanied by very long, slender setae in the inferior part of the fascicle (fig. 12, *b*). The soft parts of parapodia are now too macerated for identification; the lobes were probably short.

These specimens were first believed (Moore, 1911) to represent perhaps the epitokous phase of *Lumbriconereis minuta* Treadwell (above), but since they differ also in other characters (hooks, maxillary parts) they are now thought to be different. There have been several species of *Lumbrineris* described from great depths, most of them characterized by the presence of long setae in a median region. This feature may be an adaptation to life at great depths or to a unique type of substratum. *L. punctata* McIntosh (1885, p. 252) from off New York, in 1,240 fathoms, blue mud, and *L. ehlersi* var. *tenuisetis* McIntosh (1885, p. 253) from between New York and Halifax in 1,340 fathoms, blue mud, are both said to have long, narrowly limbate setae in a region at about the thirtieth segment. *L. punctata* is different in that maxilla II has only two teeth on the left side and three (or four?) on the right; in *L. ehlersi* var. *tenuisetis* maxilla II has five teeth on each side and maxilla III has two teeth. *L. abyssorum* McIntosh (1885, p. 250) from off the western coast of South America, in 2,225 fathoms, blue mud, was described from very fragmentary materials in which the hooks had been lost; the longest setae, however, are much shorter than in *L. moorei*.

Two other species of *Lumbrineris* with long setae have been described from shallower depth—*L. neo-zealandiae* McIntosh (1885, p. 248) off New Zealand, in 700 fathoms, blue mud, and *L. kerguelensis* McIntosh (1885, p. 246) from off Kerguelen, in 110 fathoms, volcanic mud. The first was seemingly based on several species described as "varieties A, B, and D," of which only "variety A" supposedly has long setae; "varieties A and B" have dark acicula, "variety D" has yellow acicula. The second has composite setae in

an anterior region, hence different from the other species. It is difficult to make close comparison of these species with long setae because of the lack of information on several important points.

L. moorei is known only from off Catalina Island, in 1,350–2,182 fathoms, in gray mud and fine sand.

LUMBRINERIS PARVA-PEDATA (Treadwell)

FIGURE 10, *i, j, m*

Lumbriconereis parva-pedata TREADWELL, 1902, p. 198 (U.S.N.M. No. 16019; Ensenada Honda, Culebra).

Lumbrineris elongata TREADWELL, 1931, p. 3 (U.S.N.M. No. 19622; Louisiana).

This species resembles a *Drilonereis* because of its long, slender, cylindrical form, and its proportionately tiny anterior parapodia. The proboscideal apparatus was not originally described. The maxillary carriers are comparatively massive, nearly as long as the forceps, broad at their place of attachment to the forceps, laterally constricted, and terminate distally in long, slender tips. The forceps taper to simple, falcate tips. Maxilla II has six teeth on each side, the distalmost tooth being shorter and somewhat recurved over the edge of the maxillary plate so that it is apt to be overlooked unless the plate is slightly turned; maxilla III has two blunt teeth on each side; maxilla IV has a single point on each side. Mandibles are white, calcareous, but now considerably eroded and soft; the two parts are long, nearly equaling the length of the entire maxillary apparatus; the base is incised for a short distance; the distal end is broad but not flaring.

No composite setae could be distinguished, but setae in the first few segments have been broken off flush with the body wall. In the original description simple hooks are shown in the second parapodium, accompanied by limbate setae. Anterior parapodia resemble those more posteriorly except that the latter are stouter. There is a triangular postsetal lobe (fig. 10, *i*). Hooded hooks (fig. 10, *m*) are distally finely denticulate.

This type has been compared with that of *L. elongata* Treadwell (1931, p. 3) from Louisiana, and the two are believed to be identical. Both are long, slender, greatly attenuate, with tiny parapodia in anterior segments, with simple hooded hooks present in anterior segments (fig. 10, *m*) already from the first. The proboscideal apparatus of *L. elongata* (now missing) was described as follows: "The forceps have a prominent carrier and a slender terminal portion. The left paired plate has a slender terminal tooth followed by three much heavier ones, and a basal hump that may be the remnant of a tooth [total 4]. The second paired plate [maxilla III] has two teeth, the terminal plate [maxilla IV] only one. The jaw was badly broken in removing and only the left side is intact, but so far as could be

determined the plates are symmetrical on the two sides." This differs, therefore, from *L. parva-pedata* only in that maxilla II has a different number of teeth, but as pointed out above the exact outlines are sometimes difficult to discern; also, the number of denticulations is not sharply distinctive. In other respects these two are so similar that separation is difficult.

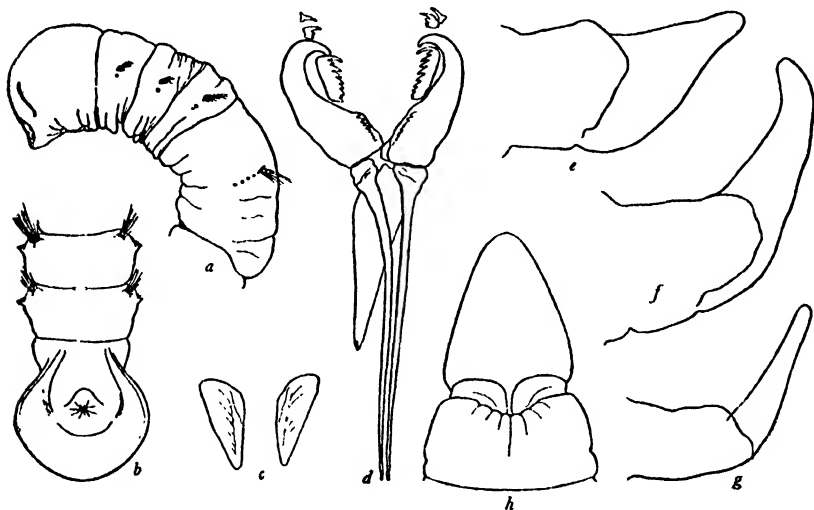


FIGURE 11.—Species of PETALOPROCTUS, DRILONEREIS, and LUMBRINERIS (enlarged)

- a, b, Petaloproctus filifer* (U.S.N.M. No. 5214): *a*, Outline of an anterior parapodium; *b*, posterior end in dorsal view.
c, d, Drilonereis robusta (U.S.N.M. No. 15813): *c*, Mandibles; *d*, maxillary carriers, unpaired piece and plates.
e-g, Lumbrineris erecta (cotype, No. 2585, Philadelphia Acad. Nat. Sci.): *e*, Tenth parapodium; *f*, a median parapodium; *g*, a posterior parapodium.
h, Lumbrineris maculata (U.S.N.M. No. 16018): Prostomial lobe in ventral view, showing specimen with elongate lobe.

Another related species is *L. robusta* Ehlers (1887, p. 104) from Florida, in 75 fathoms, and Habana, in 175 fathoms. It also has massive maxillary carriers and small maxillary plates; parapodial lobes are short throughout and have similar outlines. Maxilla II has five teeth. According to Ehlers, however, maxilla III has only one tooth, and the mandibles are separated at their bases for a greater distance. Most importantly, the body proportions are less attenuate, such that 182 segments measure 68 mm. long and 5 mm. wide.

LUMBRINERIS MACULATA (Treadwell)

FIGURES 11, *h*; 14, *d, e*

Lumbriconereis maculata TREADWELL, 1902, p. 198 (U.S.N.M. No. 16018; Puerto Rico).

The prostomial lobe is bluntly conical in one individual (about as long as broad), but considerably longer in another (fig. 11, *h*). Maxillary carriers are longer than wide and terminate basally in slender tips, more than shown (Treadwell, 1921, fig. 384); there is a lateral constriction on the proximal half. Forceps are falcate; maxilla II has four teeth on each side; maxilla III has two teeth on a side; maxilla IV has a long, slender, pointed piece on each side.

Parapodia from the first setiger have both limbate setae and simple hooded hooks, the postsetal lobe already long, triangular; a second parapodium is shown in figure 14, *d*. Posterior parapodia have slender, longer, postsetal lobes and are provided with only hooded hooks (fig. 14, *e*).

The specific name is preoccupied by M. Edwards (in Cuvier's Règne Animal) and by Quatrefages (1865, p. 365), but since both of these are believed to be *Arabella* species (Fauvel, 1923, p. 438), a new name is not applied.

L. maculata Treadwell is known only from Puerto Rico and Florida (Treadwell, 1921, p. 103).

LUMBRINERIS BILABIATA (Treadwell)

Lumbriconereis bilabiata TREADWELL, 1902, p. 199 (U.S.N.M. No. 16015; Mayaguez Harbor, Puerto Rico).

The only collection is a small fragment, 12.5 mm. long, with 59 setigers, caudally incomplete, all setae too badly damaged to identify. The prostomial lobe is depressed conical, longer than broad, without sulcus. Already in anterior segments the postsetal lobe is slender, digitiform, standing at an angle, directed more or less posteriorly, away from its base.

In the original description the proboscideal formula was not given. The forceps are falcate; maxilla II has five teeth on each side; maxillae III and IV have one tooth each.

LUMBRINERIS ERECTA (Moore)

FIGURE 11, *e-g*

Lumbriconereis erecta MOORE, 1904, p. 491 (San Diego, Calif.).

The types of this species are not deposited in the National collections; cotypes are contained in the Academy of Natural Sciences of Philadelphia (No. 2585). Through the kindness of Prof. J. Percy Moore, I was permitted to see them. There are three large, robust specimens, agreeing closely with many specimens collected by the author in the intertidal zones of southern California. The prostomium has a longitudinal groove ventrally, as originally stated, but this is weak in one individual. Figure 11, *e-g*, shows a tenth, a median and a posterior parapodium. Simple hooded hooks are present from the thirty-seventh segment, continued to the end.

Limbate setae are continued to the end, but absent from some parapodia. Perhaps this led Moore (1904, p. 491) to say that "by 50 [uncini] are alone present to the number of 4 or 5 which is further reduced to two or even one posteriorly * * * the slender setae do not altogether disappear until about LXXV." Actually, in these cotypes, as also in many specimens from southern California, some posterior parapodia continue to have limbate setae, to the posterior end.

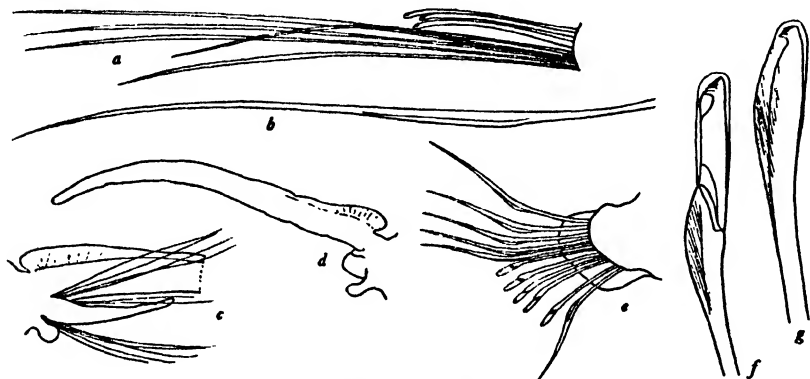


FIGURE 12.—Species of *LUMBRINERIS* and *ARMANDIA* (enlarged)

- a, b, g, Lumbrineris moorei* (U.S.N.M. No. 17403): *a*, A posteromedian parapodium with long setae; *b*, bilimbate seta from an anterior parapodium; *g*, a hooded hook from a posteromedian parapodium.
- c, d, Armandia agilis* (U.S.N.M. No. 4898): *c*, Seventh setiger in anterior view, the branchia cut off at the dotted line, with long, presetal, dorsal lobe and rounded, postsetal, ventral lobe; *d*, parapodium from posterior third of body, in posterior view.
- e, f, Lumbrineris minuscula* (U.S.N.M. No. 5215): *e*, An anterior parapodium, in anterior view, setae indicated; *f*, a composite seta from an anterior parapodium.

L. erecta is the commonest lumbrinerid with elongate, parapodial lobes, lacking hooded hooks anteriorly, in the intertidal of southern California. It occurs rarely as far north as Monterey. It has incorrectly been confused with *L. heteropoda* (see below).

LUMBRINERIS HETEROPODA (Marenzeller)

FIGURE 10, *e-g*

Lumbriconereis heteropoda MARENZELLER, 1879, p. 30 (Miya Bay, Japan).

The National collections contain specimens of what are believed to be this species, originating from Honshu Island, Japan. Since they differ notably from *L. erecta* Moore (see above), with which the latter has sometimes been identified (Crossland, 1924, p. 4), and also since Marenzeller's description seems to have been misinterpreted in some respects, the following remarks are added.

As Marenzeller's description was based on a specimen 120 mm. long, with 240 segments, it may have been almost, or quite, complete and mature. The prostomium was described as considerably pointed, large, longer than broad, as long as, or longer than, the first three segments. Parapodia differed in the various body region, as follows: "An den vorderen Rudern ist die Hinterlippe von vorne nach rückwärts zusammengedrückt, von oben gesehen schmal, am Ende etwas angeschwollen, die Vorderlippe kurz, fast gar nicht vorspringend [fig. 10, *e*, based on specimen in U.S.N.M.] Allmählig wird die Hinterlippe dicker [in antero-posterior axis] aber etwas kürzer, und indem auch die Vorderlippe sich mehr entwickelt, wird die Differenz in der Länge zwischen beiden verringert; erstere überrage jedoch diese stets [fig. 10, *f*]. Die Übergänge bilden sich bis etwa zum 40. Ruder heraus; von hier ab bleibt diese Form bis weit nach hinten. Die Hinterlippe [fig. 10, *g*] zeigt sich von oben als ein relativ langer fingerförmiger, nach hinten gerichteter Fortsatz, der etwa die Hälfte der Länge, vom Ursprunge des Ruders bis zum Vorderrand der nur wenig vorspringenden Vorderlippe gemessen, ausmacht." This transition of parapodial lobes from anterior to posterior regions prompted the specific name *heteropoda*. Furthermore, the first 35 segments were said to be provided with only pointed setae, numbering first 13 in a parapodium, decreasing to 8 in the thirty-fifth. Hooded hooks were present from the thirty-sixth segment, accompanied with pointed setae, the latter continued in diminishing numbers to the end (at least through 200 segments).

Crossland (1924, p. 4) united *L. heteropoda* with *L. erecta* Moore (above) seemingly because of a misinterpretation of Marenzeller's description, based on collections from the Red Sea, Zanzibar, and Kenya Colony, but none from Japan or California. They are here believed to be distinct from each other, and perhaps each different from the Indo-Pacific specimens. Crossland concluded that Marenzeller did not see posterior segments in his specimen, yet Marenzeller states that he had a 240-segmented individual, and one that "gegen das Leibesende sich allmählig verjüngend." Crossland interpreted this as a regenerated specimen; it might be interpreted as one that was nearly complete, tapering posteriorly. Marenzeller stressed the marked difference in parapodial lobes of anterior, median and posterior segments, as described above.

In both *L. erecta* and *L. heteropoda* anterior parapodia lack hooded hooks, in the first through 40 to 44 segments, in the second through about 36 segments; both have pointed setae, though in diminishing number posteriorly throughout the body length; both have similar maxillary parts but the maxillary carriers are proportionately shorter and broader in *L. erecta* than in *L. heteropoda*. In *L. erecta*, middle

body segments have parapodia with prominent postsetal lobes which come to have the form of long, fingerlike processes, bending abruptly upward nearly at right angles, rising above the back.

One other species merits consideration in a discussion of this group, *L. sarsi* Kinberg (1865, p. 569) from Guayaquil, Ecuador. The type has greatly elongated posterior, postsetal lobes, but here the anterior-most parapodia, from the first, have some simple hooded hooks, accompanied by limbate setae.

LUMBRINERIS ZONATA (Johnson)

FIGURE 13, a-c

Lumbriconereis zonata JOHNSON, 1901, p. 408 (Puget Sound, Wash.).

Lumbrineris heteropoda MOORE, 1908, p. 346 (Kodiak Island, Alaska, in 35-41 fathoms) (not Marenzeller, 1879).

Lumbrineris sarsi HARTMAN, 1938, p. 12 (not Kinberg, 1865).

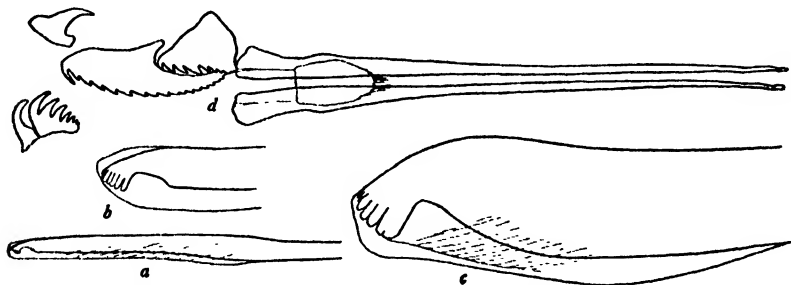


FIGURE 13.—Species of LUMBRINERIS and ARABELLA (enlarged)

a-c, *Lumbrineris zonata* (Kodiak Island, Alaska): a, Hooded hook from first setiger, showing long hooded region; b, distal end of same hook enlarged; c, one of five hooded hooks from a posterior parapodium, showing distal hooded region.

d, *Arabella iridescens* (U.S.N.M. No. 5216): Part of maxillary apparatus in dorsal view.

In the original description of this species, it is stated "setae * * * of two forms: winged capillary in anterior portion of the body and hooded crotchets in the posterior region," implying that hooded hooks are absent in anterior segments. I have again examined the type of *L. zonata* (at the Museum of Comparative Zoology) and verified the presence of simple hooded hooks in at least the second setiger (setae of the first are broken away near their base).

In many specimens examined, from Puget Sound south to southern California, the presence of simple slender hooded hooks (fig. 13 a, b) already from the first setiger, has been ascertained. After about the thirtieth or fortieth segments, these slenderer hooks are gradually replaced by heavier simple hooks (fig. 13, c) with shorter sheath. In most individuals limbate setae are entirely lacking in far posterior

segments, but occasionally a single, slender, limbate seta is present near the superiormost part of the fascicle. A twenty-first neuropodium contains 5 dark acicula, 10 inferior pointed setae, 6 simple hooded hooks, 10 superior pointed setae; its notopodium is provided with an embedded fascicle of acicula. A far posterior parapodium may contain three black acicula and about five hooded hooks, usually no limbate seta.

L. zonata is common in the intertidal zones of the northeast Pacific, to considerable depths. The National collections contain specimens from the Behm Canal, Alaska (Albatross stations), including depths of 14 to 256 fathoms.

Genus ARABELLA Grube

ARABELLA IRICOLOR (Montagu)

Nereis iricolor MONTAGU, 1804, p. 83.

Lumbriconereis tenuis VERRILL, 1873, p. 594 (part) (U.S.N.M. No. 13383; Vineyard Sound, in 12 fathoms).

A collection labeled "Cotypes" includes numerous small, slender individuals of *Arabella iricolor* (Montagu). The prostomium is subglobular, with four eye spots in a transverse row; parapodia are provided with only pointed, limbate setae, hence *Arabella*. The proboscideal armature is typical of *A. iricolor*.

In the original description the prostomium was said to lack eyes, also, at the sixteenth segment "recurved spatulate setae, with two to three hook-like denticles at the end [hooded hooks?], while two or three lanceolate ones remain." It seems, therefore, that these so-called "Cotypes" are not the same as that on which the first description was based. A holotype has not been found.

ARABELLA IRIDESCENS Treadwell

FIGURE 13, d

Arabella iridescens TREADWELL, 1906, p. 1171 (U.S.N.M. No. 5216; Pallolo Channel, between Molokai and Maui, in 12 fathoms).

There is only a single fragment, with much of the maxillary apparatus missing and most of the setae broken away flush with the body wall. The prostomium is elongate, depressed, triangular, without eye spots or other color markings; it lacks a median sulcus but has a depression in the middle on both dorsal and ventral sides. The proboscideal region has been largely dissected out; mandibles are lacking but some maxillary parts (fig. 13, d) remain. The carriers are very long, slender, with a short, rounded, ventral, unpaired piece that terminates in a ragged edge; the whole only slightly chitinized. Maxilla I on the right side is roughly triangular in outline, with 8 (or 9) teeth on the cutting edge. Maxillae II and III (fused) have 16 teeth; maxilla IV is presumably lost from this

specimen; maxilla V has a single tooth (fig. 13 *d*). On the left side only two plates (IV and V) remain. The formula, insofar as can be determined, appears to be : Right side = 8 (or 9) + 16 + 1 + 1; left side = 1 + 1 + 7 + 1.

In posterior segments limbate setae are distally pointed, curved in the winged region; the superiormost and inferiormost are smooth, but three or four in the median part of the fascicle are denticulate, with several rows of spinelets in the thickest region.

A. iridescens is characterized in having a depressed, triangular prostomium without eye spots; maxilla I has numerous teeth on the cutting edge. Its proboscideal armature resembles that of *A. geniculata* Claparède (Fauvel, 1923, p. 439), but the latter has prostomial eyes.

ARABELLA ZONATA (Moore)

Notocirrus zonata MOORE, 1903, p. 45 (U.S.N.M. No. 15736; off Honshu Island, Japan, in 34 fathoms).

There is only a single incomplete fragment that was dried when received; it lacks head and anterior end, including proboscideal parts. Parapodia are provided with only simple, pointed, limbate setae, such as characterize *Arabella*, but lack heavy acicular setae such as are present in *Drilonereis*. (See below.) It is therefore referred to the former.

Genus DRILONEREIS Claparède

DRILONEREIS ROBUSTA (Moore)

FIGURE 11, c, d

Laranda robusta MOORE, 1903, p. 454 (U.S.N.M. No. 15813; off Japan, in 173–260 fathoms).

This species belongs to a small group of lumbrinerids in which (1) parapodia are provided with only simple, pointed limbate setae accompanied by single, heavy, projecting, acicular setae, (2) the prostomium lacks eye spots but has a conspicuous median, longitudinal sulcus on its dorsal surface, (3) the maxillary carriers are long, paired, slender pieces accompanied by a shorter, flat, unpaired piece on its ventral side, (4) forceps are long, strongly falcate, with denticulations at the base, and (5) mandibles consist of a pair of short, flat pieces about twice as long as wide. These characters are intermediate between two genera—*Arabella* Grube and *Drilonereis* Claparède—and differ from the first in lacking eye spots and having heavy projecting acicular setae and from the second in having well-developed maxillary parts in which the forceps are strongly falcate, with basal teeth; the other paired pieces are also denticulate (fig. 11, *d*). It agrees most nearly with *Drilonereis*.

Heavy acicular spines are first seen to project from the antero-ventral part of the eighteenth setiger; they come to be heavier and

more conspicuous in median and posterior segments, where they are much thicker, though shorter, than the limbate setae.

The jaws were not described originally. They are as follows (proboscis dissected): The maxillary parts, including carriers, extend through setigers 3 to 13, the mandibles through setigers 1, 2, and part of 3. Carriers are long, slender, with an unpaired, ventral piece; forceps are thick, distally hooked, basally with six teeth; maxilla II has 10 teeth on each side, the distal tooth much the longest; maxilla III has a long tooth distally and four shorter teeth below; maxilla IV has a long tooth on each side (fig. 11, *d*). The formula is: I=6+1, II=10, III=5, IV=1. The ventrally located mandibles are dark, broad, flat, much shorter than the forceps (fig. 11, *c*).

Setae are smooth, narrowly limbate; a denticulate region was not observed in any examined. *D. robusta* is known only through its original discovery.

Family GLYCERIDAE

Genus GLYCERA Savigny

GLYCERA MEXICANA (Chamberlin)

FIGURE 9, *e*

Hemipodus mexicanus CHAMBERLIN, 1919, p. 349 (U.S.N.M. No. 19372; Gulf of California).

There is only an anterior fragment with proboscis retracted and the prostomium withdrawn into the anterior buccal cavity. The aileron of the jaw has a broad, spreading base and a long, produced fang (fig. 9, *e*). Setae include (1) superior, simple, and (2) inferior composite. In both of these respects it is a typical *Glycera* Savigny, to which it is hereby referred.

In anterior segments the presetal lobe is bifurcated; the postsetal lobe is short, entire. The presetal lobes are long and slender and resemble the equally long ventral cirri. Dorsal cirri are inserted far above the parapodial base.

There is little to distinguish this from *G. papillosa* Grube, from western South America. It bears resemblances also to *G. lancadivae* (Berkeley, 1939, p. 334) from Guatemala.

Family CIR RATULIDAE

Genus CIR RATULUS Lamarck

CIR RATULUS GRANDIS Verrill

Cirratulus grandis VERRILL, 1873, p. 606.

Cirratulus tenuis VERRILL, 1873, p. 607 (U.S.N.M. No. 15284; Vineyard Sound, Mass.).

The collection is labeled cotype. The prostomium is anteriorly rounded, slightly acute, without eye spots or other color marks.

Dorsal branchiae arise from the first setiger, but there is a pair of lateral tentacles inserted immediately in front. Branchial filaments (or their scars) number 10 to 12 on a side; their bases form an elongate, oval patch, the pair separated by a clear, median space equal to about half the width of one branchial base. Lateral tentacles arise from a point immediately above the notopodial base, but at the posterodorsal face of the notopodium.

Setae are pale yellow; the first 18 setigers have long, tapering capillaries; the dorsal setae somewhat exceed in length the ventral ones. From the nineteenth setiger a heavy spine is present ventrally in the neuropodium, accompanied with long, pointed setae. From the twenty-eighth setiger two such heavy spines are present, alternating with pointed setae; this arrangement continues through the rest of neuropodia. Notopodia have similar, heavy spines from the thirty-fifth setiger, in the inferior end of the fascicle, accompanied with pointed setae, continued so to the end. (Sometimes there are two heavy spines.)

In the original description (which was only preliminary) the setae were described as "long and slender in each ramus," but no mention was made of acicular spines.

C. tenuis Verrill agrees in all details with *C. grandis* Verrill, to which this is hereby referred.

Genus CIRRIFORMIA Hartman

CIRRIFORMIA FILIGERA (Chiaje)

Lumbricus filigerus CHIAJE, 1828, p. 171.

Audouinia filigera FAUVEL, 1927, p. 93.

Audouinea oculata TREADWELL, 1932, p. 17 (U.S.N.M. No. 19640; Brazil).

In the type of *Audouinea oculata*, the prostomium lacks eye spots. The first setiger has a slender filament arising from the superior end of the setal fascicle. Between the fourth and fifth setigers the dorsal branchiae arise, those of one side nearly continuous with those of the other; no median space separates those of the two sides. From about the fifty-fifth setiger the lateral tentacles arise a short distance above the notopodium; more posteriorly they are inserted progressively more dorsally so that in postmedian segments the point of insertion is nearly midway between the notopodium and the middorsal line.

Acicular setae are first present in neuropodia from about the thirty-seventh setiger, and in notopodia from about the fifty-eighth setiger. In neuropodia there are three such acicular setae, only slightly falcate, alternating with long, capillary setae, this arrangement continued through a long region. In some far posterior neuropodia only acicular setae may be present, or the capillaries may

be much reduced. Notopodia have similar, but slenderer and longer, acicular setae, also alternating with capillary setae.

This agrees fully with *C. filigera* (Chiaje), to which it is hereby referred. It is well known from parts of South America (Ehlers, 1897, p. 110; 1901, p. 183; Fauvel, 1916, p. 446). It differs from *C. capillaris* Verrill (below) in that the latter has single acicular setae in neuropodia in posterior segments.

CIRRIFORMIA CAPILLARIS (Verrill)

Cirratulus capillaris VERRILL, 1900, p. 653.

Cirratulus tenuis WEBSTER, 1884, p. 323 (U.S.N.M. No. 4797; Bermuda) (not *C. tenuis* Verrill, 1873).

The single specimen of *C. tenuis* (U.S.N.M. No. 4797) is small, much contracted, with proportions as given by Webster. The prostomium is short, anteriorly rounded, without eyes. Dorsal branchiae arise, in a pair of crowded clusters, between the fourth and fifth setigers; the scars number 10 or more on a side and leave bare a short, median space. Lateral tentacles first arise from a point dorsal to the notopodial ridge, but in median and posterior segments the point of insertion moves progressively upward so that it comes to be nearly midway between the notopodium and the middorsal line. Notopodial and neuropodial setal structures have the same form and distribution as in *C. capillaris* Verrill, to which *C. tenuis* Webster is hereby referred.

Family OPHELIIDAE

Genus AMMOTRYPANE Rathke

AMMOTRYPANE AULOGASTER Rathke

FIGURE 14, b, c

Ammotrypane aulogaster RATHKE, 1843, pp. 188-190, 205-208, pl. 10, figs. 1-3.—FAUVEL, 1927, p. 133, fig. 47.

Ammotrypane fimbriata VERRILL, 1873, p. 604 (U.S.N.M. No. 8076; off Gay Head, Mass., in 25 fathoms).

There are numerous specimens of *A. fimbriata*, labeled type (1), cotypes (2), and many others, all from various parts of New England, south to Long Island, in depths of 13 to 866 fathoms. Number of segments varies from 45 to 50. The body is slender, smooth. Branchiae are present from the second to the fifth last segment, number 40 or more pairs; they are simple, cirriform, extend distally far beyond the setal tips (fig. 14, c). Parapodia have a simple setigerous lobe and a longer, slenderer, ventral lobe. Setae are entirely simple, capillary. The anal end is provided with a long funnellike lobe, open ventrally, with a row of about seven pairs of filaments at the end, and a simple or slightly crenulate edge at its proximal end (fig. 14, b).

These specimens are not to be distinguished from *A. aulogaster* Rathke, already known from eastern North America (Webster and Benedict, 1887, p. 727).

Genus **ARMANDIA** Filippi

ARMANDIA AGILIS (Andrews)

FIGURE 12, *c, d*

Ophelina agilis ANDREWS, 1891, p. 289 (U.S.N.M. No. 4898; Beaufort, N. C.).

The collection includes three specimens; two are posteriorly incomplete. Interparapodial eye spots are present between segments 6/7, 8/9, * * * 16/17, 18/19, or 11 pairs; this is therefore a representative of *Armandia*. Setigers number 52. Branchiae are present from the second segment; they are long, cirriform, present on all other segments to the end; on their dorsal side, near the base, they have a thin, foliaceous flange (fig. 12, *d*).

On the first segment the upper presetal lobe (dorsal cirrus) is large and long, resembling a branchia except for its smaller size (it is about two-thirds as large); this gradually diminishes in size posteriorly so that in the posterior third of the body it is greatly reduced, papillar (fig. 12, *d*). The lower, postsetal lobe (ventral cirrus) is a minute, translucent, subglobular structure throughout (fig. 12, *c, d*). Setae are simple, flowing, capillary. The caudal funnel is long, compressed cylindrical, closed ventrally along a pair of longitudinal ridges, provided at its distal end with about 14 filiform cirri, and a much longer, thicker, ventral cirrus.

Armandia agilis differs from other species of the genus in its high setigerous count, in the structures of the presetal and postsetal lobes, and the closed anal funnel. It is known only from North Carolina.

ARMANDIA MACULATA (Webster)

FIGURE 14, *a*

Ophelina maculata WEBSTER, 1884, p. 322 (U.S.N.M. No. 4796; Bermuda).

The collection includes two specimens. There are 29 setigers [27 or 28 according to Webster]. Branchiae are present from the second, perhaps nearly to the end or at least to the third last segment; the posterior segments are now macerated, imperfect. The prostomium is thick, about as broad as long, but with a long, slender anterior cone nearly as long as the main part of the prostomium. Eyes cannot now be distinguished, but Webster (1884) described three, in a transverse series, near the posterior margin of the lobe.

Presetal and postsetal parapodial lobes are short, though broad, throughout, not unusual in any respect. A second has the proportions shown in figure 14, *a*. More posteriorly the postsetal lobes become

slenderer and a little longer but are never conspicuous; also, branchiae are longer but continue to be simple, cirriform. The pygidium is surrounded by about 20 papillae.

Webster described interparapodial eye spots, present from the seventh segment, numbering 11 pairs; hence this is an *Armandia*. These spots are not visible now. *A. maculata* is known only through its original discovery.

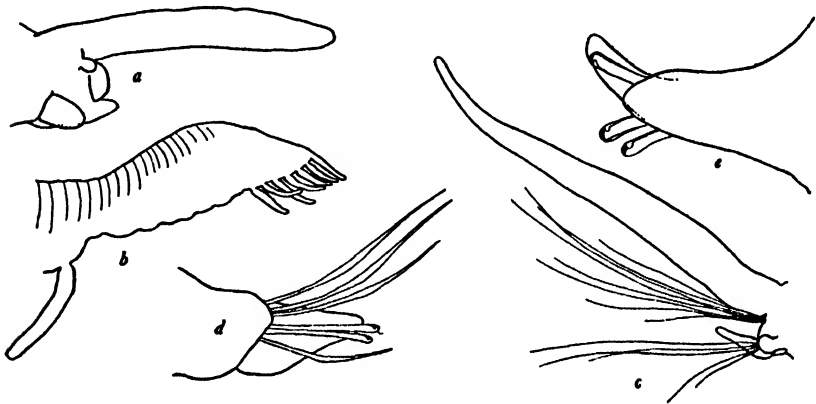


FIGURE 14.—Species of *ARMANDIA*, *AMMOTRYPANE*, and *LUMBRINERIS* (enlarged)

- a*, *Armandia maculata* (U.S.N.M. No. 4796): Second parapodium in posterior view.
b, *c*, *Ammotrypane aulogaster* (U.S.N.M. No. 8076): *b*, Anal funnel in left lateral view; *c*, seventeenth parapodium, in anterior view.
d, *e*, *Lumbrineris maculata* (U.S.N.M. No. 16018): *d*, Second parapodium, in anterior view; *e*, a posterior parapodium, in anterior view.

Genus *OPHELIA* Savigny

OPHELIA LIMACINA (Rathke)

- Ammotrypane limacina* RATHKE, 1843, pp. 190–192, 202–205, pl. 10, figs. 4–8.
Ophelia denticulata VERRILL, 1875, p. 39; 1882, pl. 9, fig. 3 (U.S.N.M. No. 16128; off Block Island, R. I., in 14 fathoms).
Ophelia limacina FAUVEL, 1927, p. 132, fig. 46.

The type of *O. denticulata* is labeled "Off Block Island, 14 fms. Aug. 18, 1874. P. M. 856 figs." Branchiae were described as denticulate; hence the specific name. Since, however, these denticulations are perhaps merely wrinkles of contraction, they are not significant. There are 9 anterior setigerous segments, lacking branchiae; this is followed by 18 branchial segments and 5 postbranchial segments, a total of 32 setigers. The anal ring is provided with 16–18 smaller papillae and 2 larger, lanceolate cirri ventrally.

This agrees fully with *O. limacina* (Rathke), already reported from eastern America by Webster and Benedict (1884, p. 724) and others.

Family MALDANIDAE

Genus PETALOPROCTUS Quatrefages

PETALOPROCTUS FILIFER (Verrill)

FIGURE 11, *a*, *b*

Maldane filifera VERRILL, 1880, p. 179 (U.S.N.M. No. 10486; Cape Cod Bay).

Lumbriclymene filifera VERRILL, 1900, p. 659.

Petaloproctus filifer ARWIDSSON, 1907, p. 114.

There is a single specimen, labeled "Type. *Mastigomaldane filifera* (Verr.). Cape Cod Bay. Aug. 30, 1879. Sta. 321. 29½ fms. *Speedwell*." It is in several pieces, perhaps of an immature individual. No color remains. The anterior end lacks a cephalic plaque, is broadly rounded, turned ventrally (fig. 11, *a*). The first three segments are shorter than the fourth. There is a long, preanal, achaetous segment, with a well-rounded, simple anal plaque. The anal aperture is turned dorsally (fig. 11, *b*). Some median segments have long, hairlike setae, as typical of *Petaloproctus*.

Verrill (1900, p. 659) transferred this species to *Lumbriclymene*, with the statement that it "does not belong to *Petaloproctus* as St. Joseph supposed, but rather to *Lumbriclymene* Sars, but it differs from the type, so that the generic characters should be altered somewhat. Its anal region consists of a somewhat flattened cone, turned up dorsally and nearly acute, but without a limbus. The small anus is close to the tip on the dorsal side of the segment, while the oblique postero-ventral side may be flat or concave. The head has a central carina with a pit each side of it, but no definite plate or limbus. The anterior ventral tori contain one or two spiniform setae. The two short preanal segments have small tori, but no setae." This agrees reasonably well with the conditions in the type specimen, and is here referred to the genus *Petaloproctus*.

Arwidsson (1907, p. 114, 118) has referred this species questionably to his *P. tenuis borealis*; the similarities are indeed striking. The synonymy appears to be justifiable. Verrill's name has priority.

Genus PRAXILLURA Verrill

PRAXILLURA ORNATA Verrill

Praxillura ornata VERRILL, 1879, p. 179 (U.S.N.M. No. 11853; off Race Point, Cape Cod, Mass., in 25 fathoms).

The single type is in several pieces, or the pieces may represent more than one individual. If only one, there are well over 20 (or 25) segments. The head is that of a *Lumbriclymenini*, the lobe well rounded, smooth, turned down anteriorly so that the mouth is clearly ventral. Nuchal slits are shallow, crescentic. The material is unsatisfactory.

Genus RHODINE Malmgren

RHODINE BITORQUATA Moore

Rhodine bitorquata MOORE, 1923, p. 223 (U.S.N.M. No. 17248; Monterey Bay, Calif., in 204 fathoms).

This is known through only an anterior end. The prostomium lacks a plaque but has a long keel and conspicuous nuchal organs; they are inverted U-shaped, angular, the inner branch about half as long as the outer. The head is bent at an angle (nearly right) to the body, and set off on the dorsal side by a sharp, narrow, transverse ridge, about one-fourth of the distance from the first setiger to the anterior end. The first two segments are very long, back of their setigerous ridges. The posterior border of the first is provided with a great, entire collar, fitting more or less closely around the body. A similar collar from the anterior border of the third setiger extends forward around the posterior end of the second setiger, but this collar is less than half as high as the other, and longest on its ventral side; it is entire, with broad, shallow, dorsolateral clefts and a short, dorsal flap. Other segments are also long but lack collar.

R. bitorquata, known solely through its original record, is the only species of this genus known from the west coast of North America.

Family SABELLIDAE

Genus SABELLASTARTE Savigny

SABELLASTARTE INDICA (Savigny)

Sabella indica SAVIGNY, 1826, pp. 412-413.

Laonome punctata TREADWELL, 1906, p. 1179 (U.S.N.M. No. 5223; Hawaii).

Sabellastarte indica JOHANSSON, 1926, pp. 15-16, fig. 5.

The type collection of *Laonome punctata* includes four well-preserved specimens, the largest about 33 mm. long. They retain much pigment, especially on the wine-colored, tentacular bases and the transversely barred radioles. The dorsal side of the thorax, and to a lesser degree the ventral side including also the abdomen, are more or less heavily speckled with deep maroon spots, and a heavier, larger spot occurs regularly on the parapodial ridge between the notopodium and neuropodium.

Radioles lack eye spots or stylodes. The collar membrane consists of conspicuous rounded lappets, not sharply separated from the lateral lobes; the ventral lappets are longer, triangular, but continuous with the lateral lobes. The setal formula is:

thorax notopodia with only bilimbate setae
 neuropodia with only avicular setae
 abdomen with only limbate and avicular setae.

These specimens are typical representatives of a *Sabellastarte*, as shown by Johansson (1927, p. 157), and do not appear to be separable from the widely known *S. indica* Savigny (Okuda, 1937, p. 307, figs.).

Genus **MEGALOMMA** Johansson**MEGALOMMA CIRCUMSPECTUM** (Moore)

Branchiomma circumspectum MOORE, 1923, p. 239 (U.S.N.M. No. 17021; off Santa Rosa Island, Calif., in 38–45 fathoms).

The collar membrane has high dorsal lappets, covering the peristomium; between its lobes and the lateral lobes there is a slight emargination and a deep cavity that extends down nearly through the first and second setigers, like a pocket; lateral lobes are slightly oblique and continued ventrally without incision, in a pair of long triangular flaps. Most radioles have small, more or less spherical, compound eyes at their tips.

M. circumspectum has been identified with *M. musshaensis* (Gravier) from the Red Sea (Monro, 1933, p. 1078), but I believe there are differences in the collars of the two that cannot be considered as mere variations of the same species. They are herein considered to be distinct.

Genus **HYPSICOMUS** Grube**HYPSICOMUS CIRCUMSPICIENS** Ehlers

Hypsicomus circumspiciens EHLERS, 1887, p. 271.

Hypsicomus purpureus TREADWELL, 1924, p. 20 (U.S.N.M. No. 20325; Antigua).

The single type specimen of *H. purpureus* originates from the Pillars of Hercules, Antigua. The eye spots, originally described, are now faded out. Thoracic spatulate setae are broad, without (or with only a tiny) mucro. This specimen agrees well with the description of *H. circumspiciens* Ehlers, except that the tentacular crown is shorter in the first; however, it had been fixed outside the tube, permitting greater contraction.

H. circumspiciens is known from the West Indian region through other records, including *Sabella alba* Treadwell (1917, p. 266) and *Parasabella sulfurea* Treadwell (1917, p. 267). Johansson (1927, p. 139) has discussed the synonymy.

HYPSICOMUS species

Potamilla californica TREADWELL, 1906, p. 1178 (U.S.N.M. No. 5222; vicinity of Monterey Bay, Calif.).

The single type specimen bears the label "vicinity of Monterey Bay. Alb. Sta. 4551. 56–46 fms." The setal fascicle in the collar is an elongate series; it is an example of *Hypsicomus* Grube.

Another collection, labeled "*Potamilla californica*" (U.S.N.M. No. 17119) from Monterey Bay, Calif., Albatross station 4496, May 19, 1904, in 10 fathoms, contains a single, large specimen of *Demonax media* (Bush). Still another collection (U.S.N.M. No. 17120) from Monterey Bay, Albatross station 4463, May 13, 1904, in 111 fathoms, contains specimens of *Pseudopotamilla intermedia* Moore.

Genus **POTAMETHUS** Chamberlin**POTAMETHUS MUCRONATUS** (Moore)FIGURE 15, *a, h-j*

Notaulax mucronata MOORE, 1923, p. 243 (U.S.N.M. No. 17351; dredged off Santa Catalina Island, Calif., in 2,196 fathoms).

There are several specimens in a mass of loosely intertwined, soft, mud-covered, slender tubes. The tentacular filaments are greatly elongated but of uneven lengths, and free for their entire length; they appear loosely attached to the thorax. There are no eye spots, stylodes, or color markings. The peristomial region is unusually prolonged, and the collar membrane does not nearly cover it.

The setal formula of the thorax is:

notopodia with bilimbate setae and spatulate setae (fig. 15, *a*)

neuropodia with long handled avicular (fig. 15, *h, j*) and pennoned setae (fig. 15, *i*)

The pennoned setae are finer than the companion avicular setae, but the two have stems about equally long. They were seemingly overlooked in the original account since thoracic tori were said to have slender crotchets only. These fascicles are thus typical of the genus *Potamethus*.

Only a few species have been attributed to this genus: (1) *Potomethus spathiferus* (Ehlers) (1887, p. 278) originates from Florida, in 275 fathoms; (2) *Potamilla malmgreni* Hansen, from Norway, was referred to it by Bush (1904, p. 203); (3) *Potamethus scotiae* (Pixell) (1913, p. 356) comes from the Antarctic. Another species, *P. elongatus* (Treadwell) (see below) comes from Hawaii. The first, second, and last appear to be distinguishable as follows:

- | | |
|--|--------------------|
| 1. Collar membrane distinctly oblique..... | 2 |
| Collar membrane straight except for ventral ends..... | <i>mucronatus</i> |
| 2. Spatulate thoracic setae with a minute mucro..... | <i>spathiferus</i> |
| Spatulate thoracic setae with a long, pointed mucro (fig. 15, <i>d</i>).... | <i>elongatus</i> |

POTAMETHUS ELONGATUS (Treadwell)FIGURE 15, *b-d*

Potamilla elongata TREADWELL, 1906, p. 1178 (U.S.N.M. No. 5221; Albatross station 3883).

The type collection, labeled "Pailolu Channel, between Maui and Molakai Islands, Albatross Sta. 3883, in 277 fms.," contains fragments of a single individual and portions of a dark, fragile, slender, silt-covered tube, very weakly chitinized. There is part of an anterior end with some radioles still attached. These are long, slender, without eyes or stylodes; they are free for their entire length. Their attachment to the thoracic region is weak. The peristomial region is long, a considerable portion not covered by the

collar membrane. The collar, though now broken, is deep both dorsally and ventrally, but strongly oblique (fixed in the tube).

The thoracic setal formula is as follows:

notopodia with bilimbate and spatulate (fig. 15, *d*) setae

neuropodia with long handled avicular (fig. 15, *c*) and pennoned (fig. 15, *b*) setae

The spatulate setae have a long, pointed mucro and are noticeably asymmetrical. Another unique feature is the long neck of the avicular setae (fig. 15, *c*) differing therein from the condition in *P. mucronatus* (fig. 15, *h*).

P. elongatus is known only through its original record.

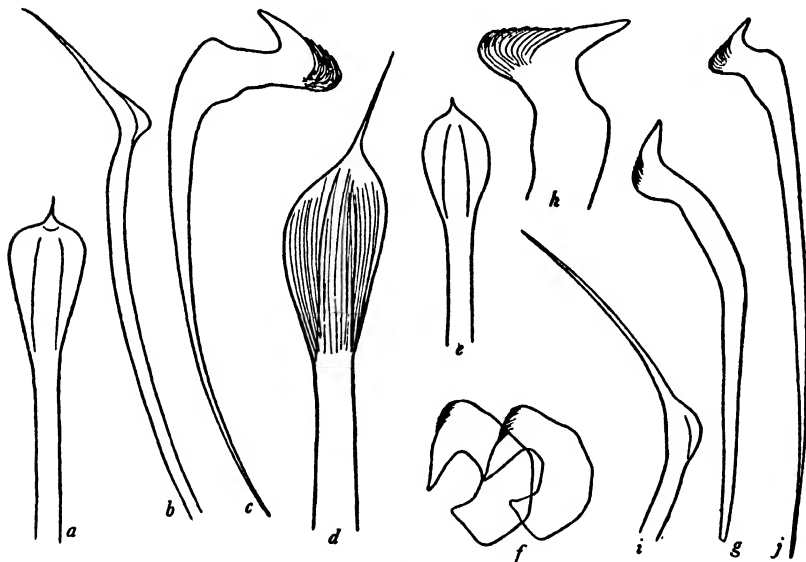


FIGURE 15.—Species of POTAMETHUS and CHONE (enlarged)

- a, h-j Potamethus mucronatus* (U.S.N.M. No. 17351): *a*, Spatulate seta; *h*, hooked end of thoracic uncinus; *i*, tip of pennoned seta; *j*, long-handled thoracic uncinus.
b-d, Potamethus elongatus (U.S.N.M. No. 5222): *b*, Pennoned seta; *c*, long-handled uncinus from same fascicle; *d*, spatulate thoracic seta.
e-g, Chone ecaudata (U.S.N.M. No. 17319): *e*, Spatulate, thoracic seta; *f*, abdominal uncinus from an anterior region; *g*, thoracic uncinus.

Genus CHONE Malmgren

CHONE ECAUDATA (Moore)

FIGURE 15, *e-g*

Jasminiera ecaudata MOORE, 1923, p. 246 (U.S.N.M. No. 17319; off Santa Cruz Island, Calif., in 38-45 fathoms).

Jasminiera ecaudata was originally described with "radioles free, without interbranchial membrane but provided on each side with a narrow, free margin of increasing width and passing into the distal

barbless tip which is flattened and coiled like a watch spring." One can still clearly distinguish just this condition on many of the radioles, but I believe the "free" condition of these radioles is due to breakage. Some of the radioles are still united by a palmate membrane, extending well over half the length of the radioles; beyond the united part, it is continued distally, the full length of the radioles, ribbonlike; the distal ends are barbless.

The thorax consists of eight setigers. It is provided with long handled uncini (fig. 15, *g*), and spatulate setae (fig. 15, *e*) in addition to superior pointed limbate. The abdomen is provided with narrowly limbate setae ventrally, and avicular uncini (fig. 15, *f*) dorsally.

The thoracic collar is fairly high, straight, the peristomium concealed. There is a middorsal notch; ventrally the collar is entire except for a slight V-shaped notch. Laterally there is a weak undulation, but the collar is entire.

This species was originally referred to *Jasminiera* because the radioles were thought to lack a palmate membrane; since, however, this is believed to have been present, it is transferred to *Chone*. *C. ecaudata* differs from *C. mollis* (Bush), also from California, in that the spatulate setae of the latter are without mucro and the abdominal uncini have a much longer beak.

CHONE INFUNDIBULIFORMIS Krøyer

Chone infundibuliformis KRØYER, 1856, p. 33.

Sabella picta VERRILL, 1885a, p. 440; 1885b, pl. 42, fig. 188 (U.S.N.M. No. 8706; off Newport, R. I., in 20 fathoms).

Chone infundibuliformis FAUVEL, 1927, p. 334.

The type of *Sabella picta* is labeled "Off Newport, 20 fms. Fish Hawk. Sta. no. 784." It is typical *Chone* Malmgren, with entire straight collar, that is rather high, slightly flaring, with a notch dorsally. The thorax includes eight setigers, provided dorsally with bilimbate setae, and spatulate setae and ventrally with long handled hooks. Abdominal uncini are avicular.

This has been compared with specimens of *C. infundibuliformis* from western Europe and is believed to be identical.

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THE SARDIS (GEORGIA) METEORITE

By E. P. HENDERSON and C. WYTHE COOKE

IN April 1940 a small, rusted fragment about the size of a half dollar was sent to the United States National Museum by Fred M. Allen, of the Chamber of Commerce in Waynesboro, Ga. Upon investigation it was found to be unusually heavy, and certain other properties suggested that it might be a meteorite. A chemical test on the specimen disclosed the presence of nickel. Further examination showed some of the unoxidized nickel-iron alloy, and these observations proved that it was a part of a meteorite. Mr. Allen was promptly notified of his find and was urged to furnish additional information, as well as a larger and better specimen for examination. He replied that the reported mass was believed to weigh several thousand pounds but said that he had not himself seen it.

The following month Mr. Allen submitted the second specimen and at this time corrected his former estimate of the size of the mass. Estimating the volume of the small specimen and knowing its weight he determined the weight per cubic inch of this material. After approximating the volume of the large specimen he predicted that it should weigh between 1,500 and 1,800 pounds. The meteorite actually was found to weigh 1,740 pounds.

In July, Mr. Allen wrote that his information had been furnished by the county sanitarian, W. H. Powell, and suggested that further correspondence be addressed to him. Mr. Powell was advised by letter of our interest in the specimen. The National Museum is greatly indebted to Mr. Allen for submitting the first sample and

also to Mr. Powell for his spirit of cooperation, as well as for the manner in which he handled the removal of the meteorite.

Location and discovery.—The Sardis meteorite was recovered near Beaverdam Creek in the northern part of Jenkins County about 200 yards from the Burke County line. The nearest town is Sardis; therefore, it is proposed that this fall should bear its name. Sardis is in Burke County, but the specimen was found just over the line in Jenkins County. The place of discovery is $6\frac{1}{4}$ miles west-southwest of Sardis and 11 miles north-northeast of Millen, in latitude $32^{\circ}56'56''$ N. and longitude $80^{\circ}51'54''$ W. as given on the U. S. Geological Survey map of the Millen quadrangle.

Though the cottonfield in which this discovery was made has been under constant cultivation for about 50 years, the meteorite was not found until 1940, when a boy fouled his plow in such a manner as to cause him to investigate the obstruction. There was either something different in the manner in which the plow snagged that day or else the boy's interests had been freshly aroused by the frequent rumors of buried treasures often reported to be in this part of the country. When General Sherman made his famous march to the sea he passed through this area, and rumor still has it that the treasures of many families were buried to protect them from the invading army and have never been relocated. The plowman knew there were no rocks in this vicinity, so that anything causing his plow to snag was rather unusual and perhaps a hidden treasure. He probably guessed that his "pot of gold" lay right here.

He uncovered the object, undercut one side, and then assisted by neighbors dug a deep cavity under one side and turned it over into the new hole. Fortunately in the struggle to overturn it a few fragments were broken off. Because of the unusual weight of these pieces the finders' curiosity was aroused, and so they sought Mr. Powell's advice as to the nature of this rock.

The treasure hunt was perhaps a disappointment to these men because, after all their struggle, they found under it only orange-red sandy clay. After reburial the meteorite remained there for nearly a year until Mr. Powell by the assistance of a wrecking truck removed it from the field, crated it, and shipped it to the United States National Museum. Little did they realize that this heavy rock was not only a treasure but one of the five largest masses of meteoritic material ever to be found in this country. Its arrival on this earth probably preceded that of white man to this continent by countless centuries.

Description of the Sardis meteorite.—The over-all measurements taken in three directions at right angles to one another are 33 by 28 by 16 inches. The general shape is that of a flattened ellipsoid, but its present shape and dimensions are of little importance because an

unknown amount of material has been removed by weathering. No features were found resembling either flight markings or the original crust of the meteorite.

In color and appearance the Sardis meteorite resembles a mass of limonite, but on closer examination a series of connecting fractures can be seen crossing the surface in a pattern resembling that made by the shrinkage cracks in sun-dried mud. Many of these fractures are as much as 2 inches deep, and on the sides of these can be seen traces of an octahedral structure.

The main mass of the Sardis meteorite weighs 1,740 pounds. As it is too heavy to be placed on the Museum's bandsaw, it will not be sectioned. It would be interesting to learn to what depth the unfractured meteorite has been altered.

When we removed the weathered soil from the place where the meteorite originally lay 20 pounds of small fragments were found. Some of these resembled a brown sandstone with hydrous iron oxide, limonite, acting as a cementing medium for the sand grains. After these pieces were cut and polished some of the larger areas of limonite were noted to have an octahedral structure, that is, it is meteoritic iron completely altered to a hydrous brown oxide.

The brown iron oxide, which served as a cementing medium for the sand grains, was found to contain considerable nickel. This indicates that the meteorite had been in part dissolved and carried away by groundwater. Also, some of the sand grains of the matrix are cemented to the fractured surfaces of the meteorite fragments, giving it the appearance of sandstone. The nickel apparently is partly retained in the iron oxide after precipitation, just as nickel and iron are precipitated together in the laboratory.

The polished surfaces of some of the pieces containing metallic iron show that the Sardis meteorite belongs to the coarse octahedrite group. Very little taenite and only one inclusion of troilite are present. A few very small inclusions of schreibersite were noticed. The alteration seems to have been most active along the boundaries between the kamacite areas.

The chemical composition of the Sardis meteorite is indicated by the following analysis (E. P. Henderson, analyst).

Fe.....	92.08
Ni.....	6.69
Co.....	0.47
P.....	0.24
S.....	trace

99.48

Topographic relations.—We did not visit the site until February 1941, which was several weeks after the meteorite had been received in

the Museum. As Mr. Powell had stated in his letters, there were no scars on the surface. The field slopes gently northward from a rounded crest encircled by the 280-foot contour line to the south fork of Beaverdam Creek, which is 0.6 mile away and flows at an altitude of 220 feet above sea level. The meteorite lay about 250 feet above sea level and about midway between the top of the slope and the creek bed. Shallow wooded valleys leading to Beaverdam Creek lie just east and west of this field, and the two slopes grade evenly together. There is no indication that this plowed field has eroded very rapidly, nor is there any evidence of craterlike depressions.

After Mr. Powell pointed out the spot, we shoveled away the weathered, sandy soil down to the hardened surface on which the meteorite had rested. This proved to be compact, sandy clay of the Hawthorne formation of middle Miocene age, which at this place is covered by about 24 inches of loose sandy residual soil. Nothing was found in the Hawthorne sediments that could be taken as evidence of any distortion or disturbance. One would suppose that a freely falling body of this size would certainly crush or shatter even any consolidated rocks on which it fell. Surely this sandy clay, under the blow of so many thousand-foot pounds, would spatter away. The craterlike scar might not be preserved for an indefinitely long time, but such a depression would last for at least several hundred years. Plowing and harrowing would tend to erase such a scar, but it is doubtful if either normal cultivation or natural agencies would level it within a single century. The present owner of the land has tilled this field for nearly 50 years, and, as the farm belonged to his father, he would almost certainly have heard about it if such a large meteorite had fallen on his farm within the past 75 years.

General topographic features of this district suggest that erosion has not been very rapid. There is no apparent geological evidence to indicate that the general surface of this area has been reduced at a rate faster than 1 inch each 100 years; in all probability erosion has been at an even slower rate.

Depth of penetration.—Many factors, each with an almost unlimited number of variabilities, determine the depth to which a meteorite penetrates into the ground. Among the important factors are the rigidity of the meteorite, its shape, velocity of descent, and the nature of the material on which it landed. Meteorites of equal weight and velocity would not all bury themselves to the same depth in loose sand, because different meteoritic individuals have different rigidities. Some stony meteorites are rather friable when found, but just how firm these objects were prior to their impact with the earth is not known. It seems likely that iron meteorites, all other things being equal, would penetrate deeper than stony ones because of their greater rigidity or toughness.



The main mass of the Sardis meteorite. This is so deeply weathered that there is almost no external evidence to suggest that it is a meteorite.



Coarse octahedrite (natural size). This section was cut from a fragment found by the authors. The dark weathered zone at the left slopes down from the plane of the polished face.

Velocity and the angle of incidence are important factors in determining the depth of penetration. An individual stone of the Hesse¹ fall weighing about 4 pounds was found on a frozen lake where it fell at a time when the ice was only a few inches thick. An object of this weight falling from only a mile high would exert 21,200 foot-pounds of energy, which surely would be sufficient to puncture the ice if this force were applied in a direction normal to the surface.

Since the individual stone failed to break the ice, the meteorite must have either approached the ice with a high angle of incidence or for some reason had its velocity greatly reduced. Recorded statements of eyewitnesses indicate that the Hesse meteorite had a remarkably small downward velocity.

The Allegan, Mich., meteorite weighing 70 pounds penetrated a sandy soil only about 18 inches, but this stony fall, when recovered, was considerably shattered. The 660-pound Knyahinya stony meteorite struck the ground at an estimated angle of about 25° from the vertical and penetrated to a depth of 11 feet. The Hraschina, a 71-pound iron, was reported to have penetrated 18 feet; the 820-pound Paragould, Ark., stone, a witnessed fall, penetrated the clay soil to 8 feet. The Hugoton, Kans., meteorite, a 749-pound stone, was recovered in a cornfield where it, too, was discovered by fouling the plow-point. The base of the Hugoton was only 3 feet below the present surface of the field, but this stone may be a very old fall, and much of its covering had been eroded away.

Nininger² has summarized some information on the average depths of individuals according to their weight:

Number of individuals	Weight of specimens	Depth of penetration
	<i>Pounds</i>	<i>Inches</i>
6-----	50-100	32
7-----	100-200	43
2-----	200-400	48

In the Odessa crater of Ector County, Tex., which has been under investigation for some time, recent work indicates that perhaps a large mass of this fall has been located. "Two test holes, 10 feet apart, encountered at a depth of 164 feet, a mass that was essentially unaffected by pounding of the 1,500-pound drilling bit. This is believed to be a meteorite."³

¹ Flight, Walter, History of meteorites, p. 2, 1887. London.

² Nininger, H. H., Depth of meteorites and gradation of the Great Plains. Journ. Geol., vol. 44, No. 1, p. 66, 1936.

³ Sellards, E. H., Private communication.

As the Sardis iron meteorite is sufficiently firm to withstand the impact with the earth without failing, it should have been able to penetrate sandy soil to a depth of more than 6 feet. The base of the Sardis rested somewhere between 24 and 30 inches below the present surface of the plowed field. This would indicate, if any value whatsoever can be attached to the conservative estimate of the 6-foot penetration, arrived at indirectly, that at least 48 inches of sediment has been removed from above this meteorite since it fell.

If 4 feet of sediment has been removed from this surface, the top of the unweathered Hawthorne was once well above the uppermost part of the Sardis meteorite, for the bottom of the soil zone tends to weather down as the top is removed. Loose sand derived from the Hawthorne formation would have been the material scattered by the impact of the meteorite, but erosion long ago has removed that old weathered soil, and thus carried away all traces of its crater. Likewise, if the compact Hawthorne beds had been shattered by the impact, the weathering agents and circulating waters would tend to obliterate all effects of the disturbance.

Time of fall.—For reasons already stated it seems likely that the Sardis meteorite did not fall within the past century. Even had it struck elsewhere and ricocheted to its last resting place at any time within the past hundred years, vivid stories of a falling star or some unusual phenomenon would probably still be well known by some of the older generation living in the neighborhood. However, the question of whether it fell several thousand years, a million, or even 10 million years ago is problematical, and only indirect reasoning can be applied to date its fall. Aerial photographic maps of this district fail to show any craterlike scars within a radius of several miles that even remotely resemble a meteoric scar.

The Sardis meteorite is deeply weathered, and this weathering in itself would require considerable time; but here, again, no definite rate of weathering can be determined, as different meteorites have different degrees of stability. It is true that the Sardis specimen is not the most stable of irons. Polished sections cut from some of the larger fragments that display some iron-nickel alloy will tarnish within a few weeks when exposed to the atmosphere in the Museum; however, we have every reason to believe that if this same specimen were exposed in the open outside air, it would be much more stable. It is difficult to prove this by reasoning, but actual experience shows that some meteorites placed in the open actually disintegrate less rapidly than when placed inside a building.

As stated, the Sardis meteorite may have fallen a great many thousand years ago and have buried itself very deeply into the exposed Hawthorne formation. The estimate of 72 inches is only a conserva-

tive speculation; it might have penetrated deeper, and, if so, the geological evidence of a scar would definitely be eroded by now. This part of the Coastal Plain has little relief, and Beaverdam Creek, the principal drainage system of the immediate vicinity, has a gradient of only 10 feet in a mile. Thus erosion is extremely slow, and to remove 48 inches or more of surface might require several thousand years.

It is likewise possible that the Sardis meteorite fell into the sea in Miocene times and had its impact cushioned by striking the water, in which it gently settled to the bottom and was buried by the slowly accumulating Hawthorne formation. If this were true, corrosion would be active for a while, but the thickening oxide crust would offer increased protection as time elapsed. Furthermore, the sediments would, in all probability, soon cover it, thereby decreasing the circulation of water and retarding the rate of alteration. If the Sardis iron was incorporated in the Miocene beds at the time of their formation, the meteorite would not have become exposed to rapidly circulating water or air until late Pleistocene time or possibly until the Recent epoch, by which time a considerable thickness of upper Miocene and Pliocene sediments had been removed, and the level of permanent saturation had fallen below the meteorite.

Relation to depressions and elliptical bays.—As there are many depressions of various shapes and sizes within a few miles of the place where the Sardis meteorite was recovered, we considered the possibility that some of them might be meteorite scars. For reasons given earlier in this paper, we are inclined to believe that the Sardis meteorite fell in the far distant past, probably in Miocene time, and that any scar in the rocks made by it has long since been obliterated.

There are many depressions of various sizes between Spring Mill Branch and Little Buckhead Creek, 5 to 10 miles southwest of the place where the Sardis iron was found. A depression about one-eighth of a mile long and nearly as wide lies about three-quarters of a mile southwest of Perkins, 7 miles away. There is another bay northwest of Perkins. A bay about one-half mile long by three-eighths mile wide lies about one and one-quarter miles east by north of Magnolia Spring and 6 miles southwest of the spot.

About 10 miles west-northwest of the site of the Sardis find there are several parallel depressions about three-eighths of a mile long by about one-quarter of a mile wide extending a few degrees east of south.

These depressions or bays are considered by C. W. Cooke to be sinks made by solution of the Cooper marl, which crops out at Magnolia Spring on Spring Mill Branch.

Another group of sinks near the head of Beaverdam Creek, 3 to 5 miles northwest of this find, presumably is the result of solution of a calcareous bed in the Barnwell formation, which immediately underlies a thin cover of overlapping Hawthorne formation in that region. Several ponds about 12 miles north of the Sardis site and occupying depressions in the Barnwell formation, indicate either solution of the Barnwell or the McBean formation, which lies beneath the surface. Both formations contain soluble beds.

Besides these comparatively small ponds and bays of somewhat irregular shape and orientation, which obviously were formed by solution, aerial photographs reveal on the plains of South Carolina 20 miles east several groups of much larger but very shallow elliptical depressions, all trending N.45°W. These are of the "Carolina bay" type, about whose origin there has been much speculation.⁴ We are of the opinion that these bays are not scars of meteorites, as has been suggested. They are much too shallow in proportion to their area, many being much more than 200 times as wide as deep, whereas craters of known meteoritic origin range from 29.4 to 6 times.⁵

The Sardis meteorite, because of its size, represents one of the most important meteorites of this country. If the total known weight of this fall is compared with the total known weights of other falls, the Sardis stands as the tenth on the list of meteorites from the United States. It is of more importance than that because only five larger meteoritic specimens have so far been found in this country.

The following list gives in descending order of their total recorded weights the 11 largest known meteorites ever to have fallen in this country. Such weights are never accurate, and perhaps in cases such as Canyon Diablo and Brenham they are far too conservative.

⁴ Melton, F. A., and Schriever, William, The Carolina bays—are they meteorite scars? *Journ. Geol.*, vol. 41, pp. 52-66, 1933.

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⁵ Spencer, L. J., *Geogr. Journ.*, vol. 81, No. 3, Mar. 1933.

ELEVEN LARGEST METEORITES FOUND IN THE UNITED STATES

Name	State	Weight in kilograms
1. Willamette.....	Oregon.....	12, 727
2. Canyon Diablo.....	Arizona.....	4, 545
3. Navajo.....	Arizona.....	2, 188
4. Alpine.....	Texas.....	1, 818
5. Quin Canyon.....	Nevada.....	1, 450
6. Goose Lake.....	California.....	1, 169
7. Brenham.....	Kansas.....	1, 000
8. Tucson.....	Arizona.....	975
9. Cosby Creek.....	Tennessee.....	960
10. Sardis.....	Georgia.....	800
11. Red River.....	Texas.....	743

As far as the Museum's records show, no individual fragment of Canyon Diablo,⁶ Alpine,⁷ Brenham,⁸ Cosby Creek,⁹ or Tucson¹⁰ is as large as the Sardis specimen; consequently from the standpoint of individuals only five larger falls have been recovered from this country.

SUMMARY

A deeply altered iron meteorite weighing 1,740 pounds was found in Jenkins County, near Sardis, Ga., in the spring of 1940 and removed to the United States National Museum in 1941. Evidence indicates that it is a very old fall, dating probably from middle Miocene times. It was found in a district in which craterlike depressions are abundant, but it has no apparent connection with these depressions.

⁶ Canyon Diablo: Total known weight is far from accurate, but our records fail to show any specimens as large as the Sardis meteorite.

⁷ Alpine: Described by G. P. Merrill, Proc. U. S. Nat. Mus., vol. 61, art. 4, 1922, in which he states, "Correspondence held with view of securing the entire mass resulted in failure and I have been unable to learn of its ultimate disposition." The specimen was apparently never weighed or measured and the weight 2 tons (1,818 kg.) is an estimate of Mr. E. M. Flynn, who supplied Merrill with all information as well as sample.

⁸ Brenham: The total weight of material from this fall is about 1,000 kilograms, but according to our records no single specimen larger than 211.8 kilograms has ever been found.

⁹ Cosby Creek, Tenn.: Described by C. U. Shepard, Amer. Journ. Sci., ser. 2, vol. 4, pp. 82-85, 1847: "The large mass of meteoric iron found some years ago * * * fell into the hands of some persons who tried to break it with sledge hammers, but not succeeding, they placed it upon * * * a 'log heap' where, after roasting for some time, it developed certain natural joints of which advantage was taken with cold chisels and spikes for its separation into fragments. * * * Some remnants of the mass fell into the hands of Dr. Troost. * * * Its weight was about a ton."

¹⁰ Tucson, Ariz.: The total weight of this fall is 975 kilograms, the largest specimen is the ring-shaped mass, weighing 688 kilograms. The other is the Carlton specimen weighing 287 kilograms.

When this meteorite is compared with the total weight of other falls it is the tenth largest of all meteorites recovered to date in this country. However, it is the fifth largest individual fragment found in the United States. The Sardis meteorite is the seventeenth to be found in Georgia.



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RHOPOCRINUS, A NEW FOSSIL INADUNATE CRINOID GENUS

By EDWIN KIRK

The new crinoid genus here described ranges from the St. Louis (or perhaps Ste. Genevieve) well up into the Chester group. Specimens have been found in Illinois, Tennessee, Alabama, and Kentucky. One new species and two described species are referred to the genus. In addition two new species are known. A new family is proposed for the reception of this and certain other Mississippian genera:

PACHYLOCRINIDAE, new family

Crown compact and as a rule comparatively low. Dorsal cup broadly turbinate to basin-shaped. Three anal plates in cup. Ventral sac composed of numerous vertical rows of small plates. Sac reflexed. Arms isotomous in early forms, evolving through stages of endotomy to parendotomy. *IBr*, two, but variation is possible in *ant R*. Column pentagonal in early forms, becoming circular in section in later phylogenetic development.

Contained genera.—*Pachylocrinus*, *Rhopocrinus*, *Hylodecrinus*.

Remarks.—This family is segregated from the amorphous group commonly designated as Poteriocrinidae. More exactly, it represents a part of the family Scaphiocrinidae as conceived by Bather. *Scaphiocrinus* is a synonym or close ally of *Graphiocrinus*, and Bather in making the family was laboring under a misapprehension as to the real nature of the genus. I am elsewhere proposing the family Zeacrinidae for some of the structural types included by Bather in his Scaphiocrinidae, and the Pachylocrinidae will take care of part

of the residue. The Pachylocrinidae probably evolved from a Devonian stock much like *Decadocrinus*, or perhaps from *Decadocrinus* itself.

RHOPOCRINUS, new genus

Genotype.—*Rhopocrinus spinosus*, new species.

Generic diagnosis.—

Crown. Medium height, compact.

Dorsal cup. Broadly turbinate. Plates smooth or with pits at angles of plates and low folds normal to the faces. In all known species there is a sharply defined vertical groovelike depression between adjacent *RR*.

IBB. Small, but showing in lateral view.

BB. Large.

RR. Large. Articulating facet extends nearly full width of *R*, linear to slightly crescentic. Suture not gaping.

IBr. Low, stout. Typically two in all rays.

Arms. Stout in the basal portion, becoming slender distad. Pararendotomous—that is, above the *IIA* α rami are given off to the inside of each half-ray. The intervals between successive rami are short, there being as many as four or more rami in series above the *IIA* α . This gives the arms a great number of divisions. The axillaries tend to be spinous, in some cases the spines being of considerable length. The brachials are cuneate and in some cases do not reach to the far side of the ramus.

Post IR. *RA* is large. *X* is large, the greater part of the plate lying above the plane of the radial facets. *RT* is large. As in the case of *X*, but a small part of the plate lies within the dorsal cup proper.

Ventral sac. The ventral sac is formed of large numbers of small plates. The sac is wide and extends to three-fourths or more of the height of the arms. The distal portion bears a number of stout spines. The plates of the sac tend to be nodose, with well-defined pits at the angles of the plates.

Column. The column is circular in section and has a pentalobate lumen. The nodals are very prominent and bear cirri to within 8 cm. of the crown in medium-sized specimens of the type species.

Characteristic species of the genus.—

RHOPOCRINUS MUNICIPALIS (Troost), new combination

Poteriocrinites municipalis TROOST, 1849, p. 419, *nom. nud.*

Poteriocrinites municipalis TROOST, 1850, p. 61, *nom. nud.*

Poteriocrinites municipalis TROOST, 1909, p. 82, pl. 11, fig. 5. "St. Louis limestone, Lawrence County, Tennessee." (Probably Gasper.)

Cyathocrinus? municipalis (Troost) WOOD, 1909, p. 82.

RHOPOCRINUS PROBOSCIDIALIS (Worthen), new combination

Poteriocrinus proboscidualis WORTHEN, in Worthen and Meek, 1875, p. 518, pl. 31, fig. 1. "Upper division of St. Louis limestone, Carondelet, Missouri." (Ste. Genevieve?).

Poteriocrinus (*Scaphiocrinus*) *proboscidualis* WACHSMUTH and SPRINGER, 1880, p. 114 (339).

In addition there are at least two new species in the collections.

Geologic and geographic distribution.—The genus as known is chiefly found in the Chester. One species, *Rhopocrinus proboscidualis* (Worthen), was described as from the upper part of the St. Louis. This might well be Ste. Genevieve as now known. Another undescribed species is from the "Ste. Genevieve" near Huntsville, Ala. Another undescribed species is from the Gasper of the same region. Troost's species *R. municipalis*, judged by the lithology of the matrix, may well be Gasper. The type species, *R. spinosus*, is from beds stated to be Glen Dean.

Relationships.—*Rhopocrinus* has no apparent relationship with any known upper Mississippian crinoid genus. Among lower Mississippian genera it most nearly resembles *Pachylocrinus*. *Rhopocrinus* may readily be distinguished from *Pachylocrinus* by its turbinate cup and parendotomous arms as against the depressed, bowl-shaped cup and endotomous arms of the latter.

RHOPOCRINUS SPINOSUS, new species

PLATE 16

Of this species there are three well-preserved crowns, one with some 14 cm. of column attached. In addition, there is a partial set of arms, more complete in the distal portion than in any of the crowns. The crowns, though of fairly large size for Chester inadunates, appear to be of medium size for the species. The crown is compact. With the relatively inconspicuous cup and the many branched arms with their spinous axillaries the crinoid presents a striking appearance.

The dorsal cup is low and turbinate. It is composed of thick tumid plates. There is a sharply defined groovelike depression between each pair of radials. The *IBB* are small, not visible in lateral view, and almost completely covered by the column. The basals are relatively small. The radials are large. The radial facet is linear and extends almost the full width of the radial. *RA* is large, resting on *post* and *r post BB*, but not entering deeply between them. *X* is likewise large and rises well above the plane of the *RR*. *RT* is likewise large.

There are two *IBr* in each ray. The *IBr* are low and heavy. In the *r post R* of one of the paratypes the first bifurcation seems to

have been suppressed, and there are 10 *IBr*. This is abnormal and may be due to regeneration. The *IIBr* vary in number from four to eight. Above the *IIA* α the rami of each half-ray show endotomous branching, the number of *Br* between axillaries steadily increasing in number distad. The *IA* α and *IIA* α are nodose, but the axillaries above are, as a rule, spinous. In the proximal portion of the arms the *Br* have subparallel faces, but passing distad they become cuneate. The pinnules as a rule are poorly shown. They are of moderate length and slender.

The ventral sac is long, reaching to the tips of the arms, at least in medium-sized specimens. In larger specimens the arms may well have extended above the top of the sac. The ventral sac is composed of numerous vertical series of fairly small nodose plates. The walls of the sac seem to have been incompetent, for, as seen, the sac is flattened, distorted, and thrown into folds. The apex of the sac seems to have been somewhat flattened and carries a marginal fringe of stout spines.

The column is stout, circular in section, and has a pentalobate lumen. The nodal and internodal series are well marked, the nodals being unusually prominent. In the holotype cirri are borne by the nodals to within 8 cm. of the crown.

Relationships.—From *Rhopocrinus proboscoidialis*, *R. spinosus* may readily be distinguished by its broadly turbinate cup. The *RR* of *R. municipalis* are more highly arched, the *IBr* are relatively narrower and higher, and the arms relatively more slender for specimens of the same size than in *R. spinosus*.

Horizon and locality.—The types and only known specimens of the species are from what is known as Glen Dean near Sloans Valley, Pulaski County, Ky. The specimens are from the railroad tunnel and were collected by Bernhardina and Charles Wachsmuth.

Types.—The holotype, No. S4409a, and paratypes, No. S4409b, c, are in the Springer collection in the United States National Museum.

RHOPOCRINUS MUNICIPALIS (Troost), new combination

Rhopocrinus municipalis is represented by a badly preserved, silicified specimen, the holotype, and one even poorer specimen in the same block of limestone. The type shows part of the dorsal cup and portions of the arms. The state of preservation is so poor that it is doubtful whether the species can be identified with certainty in the future unless a series of well-preserved specimens can be found.

The crown has an approximate height of 9 cm. The arms, when the size of the cup is considered, are relatively slender and are well

separated at their bases. This gives the crown the more open character characteristic of the earlier species.

The dorsal cup has an approximate diameter of 20 mm. and a height of approximately 7.5 mm. The sides of the cup are somewhat convex, giving the cup a bowl-shaped contour. The plates are tumid. The most striking feature of the cup, and the character that can best be used to identify the species, is the radials. These are very highly convex and might readily be taken as part of the *IBr* series. This, of course, means that the interrarial vertical groove is very deep.

The proximal portions of the arms are widely separated as between adjacent rays. The brachials have highly arched backs and are deep. The *I* and *IIA* α are smooth. One *IIIA* α shows a short, blunt spine. In the higher orders of *Br* many brachials fail to reach to the far side of the ramus.

Horizon and locality.—Troost's original label and manuscript give no information about the specimens other than "Lawrence County, Tennessee." Many specimens were given to Troost, and at times his localities are erroneous. In this case the locality may well be correct. Charles Butts, who knows the general region well, says that beds as high as Gasper may occur in the county. The lithology of the rock might well be Gasper. The crinoid itself suggests a higher horizon than Ste. Genevieve. Until proved otherwise, we may accept the locality and assume a Gasper age.

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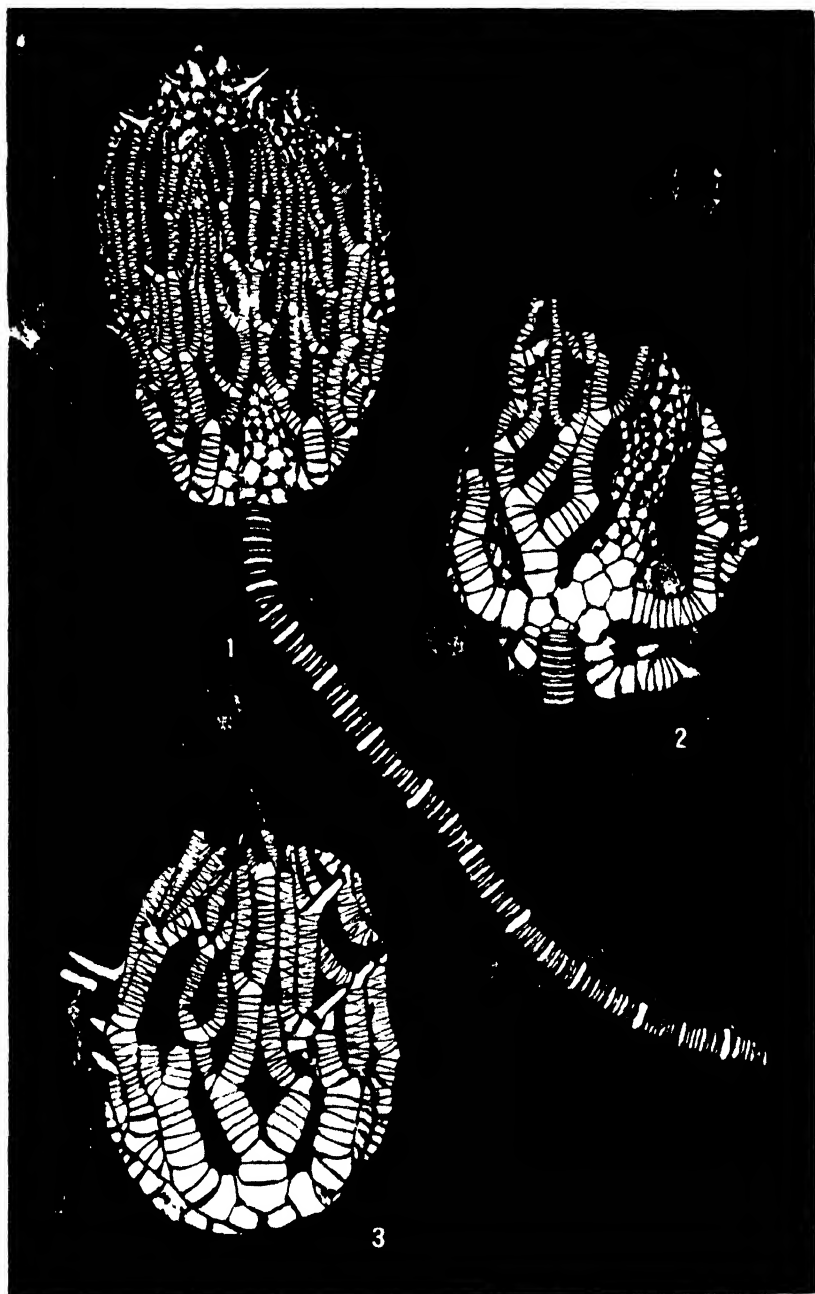
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RHOPOCRINUS SPINOSUS, NEW GENUS AND SPECIES.

1. Posterior view of holotype; 2, posterior view of larger specimen, paratype; 3, anterior view of another specimen, paratype. All natural size.



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NOTES ON BEETLES RELATED TO PHYLLOPHAGA
HARRIS, WITH DESCRIPTIONS OF NEW GENERA AND
SUBGENERA

By LAWRENCE W. SAYLOR

THE discussions presented and the conclusions reached in the present paper are the result of a critical study of 543 species of phyllophagan beetles from North, South, and Central America and the West Indies. These species are divided among four genera, with subgenera, as follows: (A) *Phyllophaga* Harris, 453 species (distributed in subgenus *Phyllophaga* sensu stricto, 326 species; subgenus *Listrochelus* Blanchard, 56 species; subgenus *Phytalus* Erichson, 51 species; subgenus *Chlaenobia* Blanchard, 12 species; and remaining subgenera, 8 species); (B) *Cnemarachis*, new genus, 85 species (distributed in subgenus *Cnemarachis* sensu stricto, 84 species, and *Aberana*, new subgenus, 1 species); (C) *Clemora*, new genus, 2 species; (D) *Triodonyx*, new genus, 3 species.

About half of the species of *Cnemarachis* were studied at the United States National Museum, while nearly all the remaining 500 species are represented in my collection.

In addition to the species enumerated above, I have studied well over a hundred species of *Ancylonycha* Dejean (synonyms: *Holotrichia* Hope and *Brahmina* Blanchard), most of them undetermined, and also a large number of species of closely related genera (*Heptaphylla*, *Microtrichia*, *Haplidia*, *Encya*, *Empecta*, *Trematodes*, *Metabolus*, *Hoplochelus*, *Rhizotrogus*, *Lepidiota*, and others), some of which are valid and others apparently inseparable from *Phyllophaga*.

A number of years ago I discovered that all the adult West Indian *Phyllophaga* are distinguished from the continental American forms by possessing spined middle and hind tibiae and by nearly or entirely lacking a tibial carina. In 1937 I called these tibial characters to the attention of Drs. A. G. Böving, E. A. Chapin, Milton Sanderson, and others. From Dr. Böving I learned that he could separate the West Indian larvae from those of the continent and so was pleased when he agreed to accompany the present paper on the taxonomy of the adults with a paper concerning the taxonomy of the larvae.¹ The conclusions reached independently by Dr. Böving and myself, on the limits of the genera discussed herein, are practically identical.

TRIODONYX,² new genus

Male and female practically inseparable as to the external characters (antennal length, robustness of body, abdominal characters, etc.). Male abdomen with the fifth and sixth sternites plane as in the female. Clypeal suture straight or nearly so. Labrum about three-fifths the width of clypeus and slightly projecting in front of clypeus, widely and deeply cleft at middle. Each claw with a very strong median tooth, an obtusely rounded and not at all prominent basal dilation, and a third small but very distinct tooth between the dilation and the median tooth. Anterior tibia tridentate. Hind and middle tibiae each with traces of a transverse carina visible only at each side; inner posterior margin slightly crenate. Spurs of hind tibia free, usually slender. Abdomen convexly rounded, the transverse sutures hardly visible; sixth segment short, free, plane in both sexes. Propygidium with a broad, flat, median longitudinal sulcus, about one-twelfth the width of the pygidium, the margins of the sulcus slightly overhanging. Male genitalia symmetrical, tubular and very large for the size of the insect. Other characters as in *Phyllophaga*.

Genotype.—*Phyllophaga gigantissima* Saylor. The species, described by me in the April 1935 issue of the *Revista de Entomologia* (vol. 5, p. 33), was based on two male specimens; since that time I have seen a small series of both sexes, all from the State of Sinaloa, Mexico.

The genus is distinct from *Phyllophaga*, *sensu stricto*, in the characters given above; the close similarity of the two sexes, especially in the abdominal characters, is surprising.

The two tarsal teeth in addition to the small basal dilation are, to the best of my knowledge, found only in the genotype and in *P. lalanza* Saylor and *P. ecostata* Horn. These three species are the only

¹ Proc. U. S. Nat. Mus., vol. 92, No. 3146.

² *tri*, three + *odous*, tooth + *onyx*, claw.

described ones known to me that belong in *Triodonyx*. *P. ecostata* possesses most of the characters of the new genus (3-toothed tarsal claws, lack of noticeable sexual differences, incomplete tibial carinae, straight clypeal carina) except that the propygidium is plane and not sulcate; in spite of this I believe it best to place *ecostata*, at least for the time being, with *lalanza* and *gigantissima*.

CNEMARACHIS,^{*} new genus

Adults with characters on the whole as in *Phyllophaga*, sensu stricto, but differing as follows: Either middle or hind tibiae or usually both, of both sexes, with an incomplete carina; lateral margins of the middle and hind tibiae usually with obviously serrate edges or with one to several moderately large to large spines; only rarely do the tibiae lack such carinae or spines or teeth. Locality: West Indies.

Genotype.—*Lachnosterna vandinei* Smyth.

The genus includes nearly all the described West Indian species formerly placed in *Phyllophaga*. These have at one time or another been listed under the following generic names: *Ancylonycha* Dejean, *Phyllophaga* Harris, *Lachnosterna* Hope, *Melolontha* Fabricius, and *Phytalus* Erichson. The genus is divided into the following two subgenera:

CNEMARACHIS, sensu stricto, new subgenus

Tarsal claws in both sexes with a distinct median or submedian tooth. Tibia never with a complete or nearly complete carina.

Type of subgenus.—*Lachnosterna vandinei* Smyth, from Puerto Rico. Nearly all the described species of *Cnemarachis* belong in this subgenus. In most of them the lateral tibial teeth are very marked, the antennal club is small and ovate, and the male abdomen is rather gibbose, much as in the females of the continental *Phyllophaga*.

ABCRANA, new subgenus

Tarsal claws entirely simple in the male (female unknown). Hind tibia with a weak, though nearly complete, carina. Middle tibia with carina usually complete, at times much feebler at the middle than at sides.

Type of subgenus.—*Phyllophaga crinitissima* More, monobasic. It occurs in Puerto Rico.

CLEMORA, new genus

The adults are similar to those of the genus *Phyllophaga* but differ from them in the following characters: Hind and middle tibiae each with very incomplete carina; lateral tibial edges with spines; and

^{*} *cnema*, tibia + *rachia*, spine.

claws cleft. The genus differs from *Cnemarachis* mainly in the shape of the claws, which in *Cnemarachis* are never cleft.

Genotype.—*Phytalus smithi* Arrow, from Trinidad and Barbados.

The genus is not well separated from the main group of *Cnemarachis*, and were it not for certain larval differences I would rather treat it as a subgenus of *Cnemarachis*.

Phytalus apicalis Blanchard, which occurs commonly in Puerto Rico, also belongs in the genus *Clemora*.

KEY TO THE PHYLLOPHAGAN GENERA OF THE NEW WORLD

1. Tarsal claws each with 2 distinct teeth (pl. 17, fig. 9e) in addition to a basal dilation and apical tooth; hind and middle tibiae of both sexes without a complete carina across each tibia, the carina indicated by a blunt toothlike lobe; propygidium with a moderately broad, well-marked, flat, longitudinal groove extending entire length of segment; no external sexual differences obvious, male abdomen simple as in female. Mexico and United States
Triodonyx, new genus
- Tarsal claws with but one tooth in addition to basal angulation and apical tooth; hind and middle tibiae with or without a complete carina; propygidium always plane; sexual differences always evident and usually well marked externally in antennal length and form and in abdominal characters; abdomen always with obvious differences between sexes..... 2
2. Either one, but more commonly both, of hind and middle tibiae of each sex with an incomplete carina (pl. 17, figs. 1-5); lateral margins of tibiae usually with separate edges or well-marked spines, rarely (*crinitissima*, pl. 17, fig. 5) without either carina or teeth or spines. West Indies..... 3
- Hind and middle tibiae each of both sexes usually with a complete transverse or oblique carina at about middle (pl. 17, figs. 1-7, 10-13); if absent on hind tibia of male, then there is a complete carina on at least the middle tibia; females always with a complete carina on both middle and hind tibiae; "lateral margins of tibiae usually without teeth or spines." American continental species..... *Phyllophaga* Harris
3. Claws never cleft, but with a median or submedian tooth. West Indies
Cnemarachis, new genus
- Claws distinctly cleft at apex. West Indies..... *Clemora*, new genus

KEY TO SUBGENERA OF CNEMARACHIS

1. Claws with a distinct median tooth; tibiae never with complete or nearly complete carina (pl. 17, figs. 1-4)..... *Cnemarachis*, new subgenus
- Claws entirely simple, without trace of a median tooth; hind tibia with a weak though nearly complete carina; middle tibia with carina usually complete, at times weakly indicated at middle (pl. 17, fig. 5).
Abcrana, new subgenus

* In rare cases, e. g., *P. inversa* (pl. 17, fig. 10), *ecostata*, and some specimens of *barda*, the carina may be weak or incomplete on both middle and hind tibiae of male, but in such instances the absence of lateral tibial spines or teeth in the males, or the presence of a complete carina of the female, if such is available, will allow ready reference to the proper genus.

* Or, if these are present, as is rarely the case, as in the Mexican species *P. bolacoides* and *scissa* (pl. 17, fig. 7), the tibiae are strongly carinate.

KEY TO THE NORTH AND CENTRAL AMERICAN SUBGENERA OF PHYLLOPHAGA

1. Claws long and simple except that each has a distinct median, submedian, or basal tooth; vertex never with a transverse carina; males of some species either with one spur connate with tibia or with only a single spur..... 2
Claws either cleft (usually rather narrowly so) or serrate or pectinate or without teeth; vertex with or without a transverse carina; males with tibial spurs free and always two in number..... 4
2. Dorsal surface with dense scales and with or without intermixed hairs. (Female with vestigial wings; male winged, its abdomen with compressed tubercles on each segment.) United States.....Tostegoptera Blanchard
Dorsal surface without scales, vestiture consisting of hairs or lacking entirely..... 3
3. Female with vestigial wings, males with functional (*fartta*) or not functional wings (*cribrota*); metasternum of female very short, only as long as second abdominal segment; both tibial spurs free in male. United States and Mexico.....Eugastra LeConte
Both sexes fully winged; metasternum in both sexes much longer than second abdominal segment; either both tibial spurs free in male or one connate with tibia or rarely one lacking. North, South, and Central America
Phyllophaga Harris
4. Claws serrate or pectinate, rarely quite simple; vertex usually with a strong to moderately strong transverse carina, rarely without a carina. North and Central America.....Listrochelus Blanchard
Claws never serrate or pectinate or simple, always variously cleft; vertex never carinate..... 5
5. Male with hind claws widely cleft, claws of fore and middle tarsi simple. (Female unknown.) Mexico.....Chirodines Bates
Claws of all tarsi similar or nearly so in both sexes and narrowly to widely cleft..... 6
6. Tarsal segments densely to moderately pilose beneath, less densely so in females (segments broadened in males of several species); color usually light testaceous. North and Central America.....Chlaenobia Blanchard
Tarsal segments sparsely pilose beneath or not pilose (segments never widened in either sex); color variable. North, South, and Central America.....Phytalus Erichson

GENOTYPES OF THE AMERICAN PHYLLOPHAGAN GENERA AND SUBGENERA

Since the genotype designations of the American genera and subgenera mentioned above are rather scattered, and also since in several cases designations have not heretofore been made, the following summary is presented:

Phyllophaga HARRIS, 1826, Massachusetts Agr. Repos., vol. 10, p. 6. Type: *Melolontha hirticula* Knoch, designated by Glasgow in 1916. Present status: Accepted as a valid genus.

* See Saylor, Proc. U. S. Nat. Mus., vol. 89, pp. 59-130, 1940.

† See Chapin, Smithsonian Misc. Coll., vol. 94, No. 9, 20 pp. 1935.

‡ See Saylor, Proc. U. S. Nat. Mus., vol. 86, pp. 157-167, 1939.

- Lachnosterna* HOPE, 1837, The coleopterist's manual, vol. 1, p. 100. Type: *Melolontha fervida* Fabricius, by original designation. Present status: Accepted as a synonym of *Phyllophaga*.
- Phytalus* ERICHSON, 1847 (not 1848), Naturgeschichte der Insekten Deutschlands, vol. 3, pt. 1, p. 658. Type: *Melolontha pubereus* Mannerheim, by present designation. Present status: Accepted as a valid subgenus of *Phyllophaga*. (Erichson described the genus but included no species in it. Blanchard in 1850 redescribed the genus and included eight species, the first of which, *pubereus* Mannerheim, is here selected as the genotype.)
- Trichesthes* ERICHSON, 1847 (not 1848), *ibid.*, p. 658. Type: *Melolontha pilosicollis* Knoch, monobasic (this is a synonym of *Melolontha tristis* Fabricius, which is therefore the type). Present status: Accepted as a synonym of *Phyllophaga*.
- Listrochelus* BLANCHARD, 1850, Catalogue de la collection entomologique du Muséum d'Histoire Naturelle de Paris, Coleoptera, p. 141. Type: *Listrochelus laportei* Blanchard, monobasic. Present status: Accepted as a valid subgenus of *Phyllophaga*.
- Chlaenobia* BLANCHARD, 1850, *ibid.*, p. 116. Type: *Chlaenobia ciliatipes* Blanchard, monobasic. Present status: Accepted as a valid subgenus of *Phyllophaga*.
- Trichesthes* BLANCHARD, 1850, *ibid.*, p. 141 (unnecessary emendation of *Trichesthes* Erichson). Type: *Melolontha pilosicollis* Knoch, monobasic (this is a synonym of *Melolontha tristis* Fabricius). Present status: Accepted as a synonym of *Phyllophaga*. (Blanchard says "absque character." of Erichson's description, though he credits it to Erichson. This is incorrect since Erichson gives a short description; and Erichson's spelling is to be accepted.)
- Tostegoptera* BLANCHARD, 1850, *ibid.*, p. 149. Type: *Melolontha lanceolata* Say, monobasic. Present status: Accepted as a valid subgenus of *Phyllophaga*.
- Eugastra* LECONTE, 1856, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 234. Type: *Tostegoptera cribrosa* LeConte, by present designation (Bloeker in 1937, Bull. Southern California Acad. Sci., p. 83, says that LeConte designated this as genotype in his original description, but that is not the case). Present status: Accepted as a valid subgenus of *Phyllophaga*.
- Endrosa* LECONTE, 1856, *ibid.*, p. 234. Type: *Melolontha quercus* Knoch, by present designation. Present status: Accepted as a synonym of *Phyllophaga*.
- Gynnys* LECONTE, 1856, *ibid.*, p. 262. Type: *Gynnys debilis* LeConte, monobasic. Present status: Accepted as a synonym of *Phyllophaga*.
- Chirodines* BATES, 1888, Biologia Centrali-Americana, Coleoptera, vol. 2, pt. 2, p. 169. Type: *Chirodines zunilensis* Bates, monobasic. Present status: Accepted as a valid subgenus of *Phyllophaga*.

MISCELLANEOUS NOTES ON SOME EXOTIC MELOLONTHINAE

MELOLONTHA MELOLONTHA Linnaeus

The peculiar elongated pygidial process will immediately separate both sexes of this European species from any of the described Melolonthinae of the New World, as also will the blunt mesosternal process prolonged between the middle coxae. Though close to *Polyphylla* in

facies, *Melolontha* has claws as in *Phyllophaga* and not as in *Polyphyla*. The antennal club of *Melolontha melolontha* is 7-segmented in the male and 6-segmented in the female.

APOGONIA CUPRESCENS Blanchard

This Philippine species is typical of the genus and is treated for the purpose of comparing adults of this and the American *Diplotaxis tristis* Kirby. I am unable to separate these two species generically, all salient characters appearing to be nearly identical. The only difference seems to be in the hind and middle tibiae, which are slender in *cuprescens* and entirely lack a transverse carina, whereas in *tristis* these tibiae are slightly more robust and have traces of a transverse carina on each. In the species of *Diplotaxis* from United States the tibial carinae vary from well-marked to nearly absent.

The larvae of the different species of *Apogonia* and *Diplotaxis* can no more be separated generically than their adults can, judged from the descriptions of the larvae of *Apogonia cupreoviridis* Kolbe from Korea,⁹ *Apogonia villosella* Blanchard, and *Apogonia cribricollis* Burm from India¹⁰ and the examination of larvae of *Diplotaxis sordida* Say and *Diplotaxis brevicollis* LeConte from the United States. I do not care at the present time definitely to synonymize these two genera but wish merely to point out the very close relationships of adults and larvae of the two. Whether they may have to be united or further divided will have to await later study of the genotypes.

HAPLIDIA TRANSVERSA Fabricius

This European species is the type of the genus by designation of Hope in 1837. *Haplidia* approaches the West Indian *Cnemarachis* in the characters of the middle and hind tibiae, which in both genera have very incomplete carinae and well-marked marginal spines; it differs from *Cnemarachis* in the less obvious sexual characters, which are evidenced only by the very slightly more robust abdomen, shorter antennal club, and shorter tarsi of the female; the sixth abdominal segment is rounded in both sexes and not differentiated as in the species of *Cnemarachis*. The most distinctive feature, and one separating *Haplidia* from all our American Rhizotrogini except *Listrochelus*, is the presence of a strong arcuate carina on the front below the vertex. In *Listrochelus* the carina is never so distinctly marked; it is always straight, never strongly rounded; and the tibial carinae are always well marked and complete. The claws of *Haplidia transversa* are as in typical continental *Phyllophaga*, that is, long and having a short submedian triangular tooth.

⁹ Murayama, Jozo, For. Stat. Chosen Bull. 11, pp. 33-36, 1931.

¹⁰ Gardner, J. C. M., Indian For. Rec., new ser., Entomology, vol. 1, p. 15, figs. 26-28, 1935.

ANOXIA PILOSA Fabricius

The males of the three European species before me, *pilosa* Fabricius, *villosa* Fabricius, and *orientalis* Krynický, differ from the male of the American *Polyphylla gracilis* Horn as follows: The terminal segment of the maxillary palpus is broader and strongly impressed dorsally; the tarsi are subequal to or shorter than their respective tibiae; the antenna is 10-segmented with 5-segmented club; and the tarsal tooth is much more strongly inclined to one side.

In the female, *A. pilosa* has a 4-segmented and *P. gracilis* a 5-segmented antennal club, while both have the front tibiae bidentate. The males of all the United States and the Neotropical species of *Polyphylla* differ from the males of the examined *Anoxia* in having bidentate front tibiae, whereas the *Anoxia* males have no external teeth on the front tibiae other than the blunt outer apical angle.

The North American *Thyce feldi* Fall is the only species of that related genus having unidentate front tibia in the male, and it is doubtful whether the number of teeth on the front tibia offers a character of more than subgeneric value.

RHIZOTROGUS (AMPHIMALLON) SOLSTITIALIS (Linnaeus)

The adult of this European species, although close to the American species of *Phyllophaga*, belongs to a distinct genus. The male *solstitialis* differs from the male of our *Phyllophaga* as follows: The tarsal segments are thicker; the front tibiae are unidentate or second tooth is hardly obvious; the middle tibiae have a very incomplete or no carina; the claws are a little thicker; the sixth abdominal segment is plane and without sexual differentiation; and the genitalia are quite tubular and symmetrical but still approach somewhat closely in form the genitalia of certain neotropical species. The major distinction between *Rhizotrogus solstitialis* and our continental *Phyllophaga* is the lack of distinct sexual differences on the abdomen.

Genus ANCYLONYCHA Dejean

Ancylonycha DEJEAN, Catalogue des coléoptères de la collection de M. le Comte Dejean, ed. 2, p. 160, 1833. (Type: *Melolontha serrata* Fabricius, the third included species; designated by Duponchel, Dict. Univ. Hist. Nat., vol. 1, p. 526, 1849.)

Holotrichia HOPE, The coleopterist's manual, vol. 1, p. 99, 1837. (Type: *Melolontha serrata* Fabricius, by original designation.)

Duponchel designated *M. serrata* Fabricius as genotype of *Ancylonycha*, and since this species is included in the original Dejean set-up, the type designation is valid, and the inclusion of a described species in the genus validates the name *Ancylonycha* Dejean of 1833.

(Blanchard's genotype designation in 1845 of *Holotrichia pubera* Dejean is not valid because "*pubera*" is a nomen nudum.)

Holotrichia, which is in such general use today, falls unfortunately as an absolute synonym of *Ancylonycha* and is not available for use, since Hope designated as genotype *M. serrata* Fabricius, the same species later designated as genotype of *Ancylonycha* by Duponchel. In our catalogs, *Ancylonycha* is listed as a synonym of *Lachnosterna* Hope or *Phyllophaga* Harris and is credited to Blanchard, 1845. In reality, the name *Ancylonycha* traces back to Dejean. In the second edition of his Catalogue, 1833, page 160, the first three species listed under this name are, in order: *pubera* Dejean (a nomen nudum), *Melolontha leucophthalma* Wiedeman, and *Melolontha serrata* Fabricius; listed in addition are 44 other "species." In the 1836 edition of the same Catalogue, on page 177, the first three names are given in the same order as in the 1833 edition, and in all 54 "species" are included, many of them nomina nuda.

ANCYLONYCHA MINDANAONA Brenske

Study of a series of reared adults of this species from Guam shows that the middle tibia is always without transverse carina and that the hind tibial carinae vary from nearly to entirely obsolete. In this character the species is close to the species of the West Indian genus *Cnemerachis*. The male genitalia are much more tubular than in most species of the continental American forms of the genus *Phyllophaga*, and the sexes of *A. mindanaona* are hardly separable because the sixth abdominal segment is not sexually modified. This last character alone, which it shares with the species of *Rhizotrogus*, separates it from the species of our continental *Phyllophaga* to which it is on the whole closely related.

All data given above support the view elsewhere presented¹¹ that the genus *Ancylonycha* cannot be separated in toto from the continental American genus *Phyllophaga* on other than geographical grounds, though many of the species placed by various authors in the genus *Holotrichia* are at least subgenerically differentiated. However, the lack of sufficient material of determined species prevents a more conclusive statement of their relationship at present.

¹¹ Saylor, Rev. Ent., vol. 7, pp. 318-322, 1937.



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DESCRIPTIONS OF THE LARVAE OF SOME WEST INDIAN
MELOLONTHINE BEETLES AND A KEY TO THE KNOWN
LARVAE OF THE TRIBE ¹

By ADAM G. BÖVING

THIS paper presents generic descriptions of the mature larvae of the genera *Cnemarachis* Saylor and *Clemora* Saylor; a specific description of the genotype *Cnemarachis vandinei* (Smyth) and taxonomic remarks about the larvae of *Cnemarachis neglecta* (Blanchard), *C. suturalis* (Chevrolat), *C. dissimilis* (Chevrolat), and *C. portoricensis* (Smyth); and a specific description of the larvae of the genotype *Clemora smithi* (Arrow) and taxonomic remarks about *Clemora apicalis* (Blanchard) and an undetermined species of *Clemora* from Cuba. After the descriptions is a synoptic key to the larvae of several exotic species of Melolonthini. The paper has been prepared to follow one by Lawrence W. Saylor ² dealing with the taxonomy of the same forms in their adult stage.

Genus CNEMARACHIS Saylor

PLATES 18, 19, FIGURES 7A, 7B, 13, 14, 19, 20

Anterior marginal part of frons with a transverse series of long setae, about seven on each side; at the middle of frons one fine, long seta on each side; and midway between this seta and the condyle

¹The data herein bearing on the systematic position in the Melolonthini of the North American genus *Phyllophaga* are to be incorporated in a comprehensive report on these beetles now being prepared under joint grants from the American Philosophical Society and the National Academy of Sciences.

²Proc. U. S. Nat. Mus., vol. 92, No. 3145.

for the mandible another fine, long seta. Epicranium with three fine, long setae on each side of the epicranial suture, and a tuft of long setae behind the ring-shaped support for the antenna, followed ventrally by several moderately long setae. Clypeus with the anterior transverse part whitish and without setae and the posterior part dark, sclerotized, armed laterally with one anterior and one posterior long seta, and between the anterior lateral seta and the sagittal line with one long seta. Labrum with apex crenulate and somewhat projecting; across the wider part of labrum an irregularly wrinkled, heavy ridge; apical projection with two stiff setae on each side; on the anterior part of ridge with a series of long setae, two on each side and on the posterior part five similar setae on each side; three long setae along each lateral margin of labrum between the ridge and the apical projection. Ocellar spots apparently absent (specimens in alcohol). Antenna slender, with four articles, penultimate article with a well-developed conical process on inner side at apex, the process with a circular sensory spot ("sensillum placodeum") facing the distal article (*PR*, fig. 7B); distal article subelliptical, somewhat asymmetrical, about four times as long as wide, terminally slightly constricted, with one large sensory spot on outer side and two smaller ones on the more curved inner side, constricted end with about seven short tactile pegs. Mandible (fig. 20) without any trace of stridulating area on ventral side; scissorial part dark, slender, with a small tooth on cutting edge near apex; exterior part of mandible limited by two apically converging carinae (*DC* and *VC*) enclosing a convex subtriangular region distally armed with one strong seta and along the entire length with seven or eight punctures; ventral carina (*VC*) with six long setae; molar part of right mandible with a subtrapezoidal heel (*calx*) about one-half as wide as long, posteriorly slightly emarginate in the middle. Maxillary lobes (lacinia and galea) fused proximally but free distally; ventral surface almost exclusively formed by galea, which ends with a single strong unci; dorsal surface formed by both lacinia and galea, which are demarcated by a longitudinal well-sclerotized sulcus; lacinia ending with three strong, basally united unci. Stipes (fig. 19) with a longitudinal row of about 15 pointed, conical stridulating teeth, each tooth (*D*) about as long as wide at base. Cardio with long setae but without unusual structures. Maxillary articulating membrane (*AM*) with many long and short setae but without dark granules or other irregular elements. Maxillary palpus projecting beyond galea, with four articles, the distal article similar in form and vestiture to the distal antennal article but with only a single sensillum placodeum, present on the outer side.

Epipharynx (fig. 13)^s with distinct epizygum (*EZ*) extending to and fused with zygum (*Z*). Plegmatium (*PL*) on each side well developed, rather broadly elliptical, consisting of 15 or more somewhat sinuous plegmata; proplegmatium (*PPL*) well developed, broadly lanceolate, consisting of about 35 fine plaits or proplegmata; chaetopariae (*C*) with moderately long setae toward pedium (*P*) and slenderer and shorter ones toward plegmatium, no sensilla interspersed between the setae, two more or less parallel rows of setae between proplegmatium and the epipharyngeal margin; zygum thinly sclerotized, six large and several small sensilla in a single, curved, transverse row along and behind the entire zygum; heli (*H*) in two transverse rows with five heli in the anterior and two in the posterior row; phobae (*PH*) present; some sensilla in front of crepis (*CR*). Prothoracic and mesothoracic legs with claw (ungulus) about one-third the length of tibiotarsus; somewhat swollen metathoracic leg with claw about one-sixth the length of tibiotarsus, with enlarged base of claw carrying one stout and one finer seta and with small, conical, terminal part of claw about as long as basal part and about one-fourth the length of the stout seta.

Raster (fig. 14)^s without septula or pali; tegilla (*TL*) composed of well-developed, flat, curved, and terminally hooked setae, either all the same length and strength or with a considerable number of stronger setae in the sagittal middle region; tegillum (*TL*) on right and left side meeting, thus forming a continuous patch (teges) occupying almost the whole of the tenth abdominal venter (*TG*).

Spiracles each with a C-shaped respiratory plate almost completely surrounding the bulla.

LARVA OF THE GENOTYPE CNEMARACHIS VANDINEI (SMYTH)

The material on which the following specific description is based is in the U. S. National Museum and consists of:

(1) *Cnemarachis vandinei* (Smyth), a full-grown larva and a set of larval and pupal skins, associated with the reared adult. Larvae collected by H. K. Plank, Puerto Rico, October 8, 1935; marked "P. R. #1616."

(2) *Cnemarachis vandinei* (Smyth), full-grown larva, associated with a reared adult determined by Dr. E. A. Chapin; the cast larval and pupal skins were not kept; collected and reared by H. K. Plank at Mayagüez, P. R., October 1935; marked "P. R. #1617."

Length of mature larva about 50 mm. Cranium (clypeus and labrum excluded) broader than long, extreme width 6 mm., length

^s For explanation of terms relative to epipharynx and raster, see Böving, A. G., Proc. Ent. Soc. Washington, vol. 38, pp. 175-181, illus., 1936.

4.5 mm., surface shallowly and finely reticulate, shining, yellowish brown (in alcohol), with numerous minute sensilla. Clypeofrontal suture well marked; frontal sutures ("arms of epicranial suture" auct.), very fine, almost obliterated, anterior half convex toward the outside, posterior half straight to concave; epicranial suture ("stem of epicranial suture" auct.), about one-third the length of one of the frontal sutures, anteriorly with a small, slightly impressed, brownish enlargement. Dorsoexterior region (*DE*, fig. 20) of mandible without punctures or small hairs; dorsomolar region (*DM*) with an oblique series of about seven setae on the right mandible and about half as many on the left mandible; a patch of several basolateral setae present. Epipharynx (*CR*, fig. 13) with two large and about seven small sensilla in the space in front of crepis; about six sensilla behind inner end of dextortorma (*DX*). Raster (fig. 14) with all the tegillar setae of approximately the same length and strength.

LARVAE OF *CNEMARACHIS NEGLECTA* (BLANCHARD), *C. SUTURALIS* (CHEVROLAT), *C. DISSIMILIS* (CHEVROLAT), AND *C. PORTORICENSIS* (SMYTH) (?)

In addition to the larvae of *Cnemarachis vandinei* (Smyth), the U. S. National Museum possesses a single or a few larvae of the following West Indian species of *Cnemarachis*:

1. *C. neglecta* (Blanchard), from Santa Rita, Puerto Rico, collected January 19, 1911, by D. L. Van Dine.

2. *C. suturalis* (Chevrolat), attacking roots of sugarcane, Baragua, Cuba; collected April 3, 1931, by H. K. Plank, reared; adult determined by Dr. E. A. Chapin.

3. *C. dissimilis* (Chevrolat), in soil, Baragua, Cuba, collected by Stahl, cast skin of mature larvae associated with the reared adult; adult determined by Dr. E. A. Chapin.

4. *C. portoricensis* (Smyth) (?): (a) in soil near banana roots, Arecibo, Puerto Rico, November 26, 1935, Faxon coll., marked "San Juan 5945"; (b) in soil around Caguas, Puerto Rico; (c) in banana roots, Mayagüez, Puerto Rico, June 27, 1935, marked "San Juan 6061."

The larva of *C. neglecta* (Blanchard) is so similar to that of *C. vandinei* (Smyth) that I have been unable to separate them. The same is also the case with the larval forms tentatively determined in the Museum collection as *C. portoricensis* (Smyth). It should be noted particularly that the appearance of the raster is identical in the larvae of these species.

The larvae of *C. suturalis* (Chevrolat) and *C. dissimilis* (Chevrolat) are inseparable but both differ from *C. vandinei*, *C. neglecta*, and *C. portoricensis* (?) in having a group of about eight very strong,

flat, terminally hooked setae arranged irregularly in the sagittal region of raster and contrasting in their size and somewhat darker color with the weaker and shorter setae in teges. In all other characters the five West Indian species of *Cnemarachis* are alike.

Genus CLEMORA Saylor

PLATE 19, FIGURES 15, 16

Anterior marginal part of frons with a transverse series of about 10 long and moderately long setae. Frons with two long setae approximate to each frontal suture ("arms of epicranial suture" auct.), one seta midway between extremities of the suture, the other between this seta and the condyle for the mandible. Epicranium, clypeus, and labrum with the same number and arrangement of setae as in *Cnemarachis*. Ocelli, antennae, mandibles, and maxillae as in *Cnemarachis*.

Epipharynx (fig. 15) with epizygon (EZ) extending to zygon (Z); plegmatium (PL) well developed on each side, broadly lanceolate with about 15 somewhat sinuous plegmata; proplegmata absent; a crescent-shaped, thin sclerome (SCL) present, indicating the anterior limit of the space that in *Cnemarachis* and many other scarabaeid larvae is plaited but here is without plaits and beset with setae from chaetoparia (C); zygon (Z) thinly sclerotized, the space behind zygon with a curved row of six large and several small sensilla, and behind these are two transverse rows of heli (H); five heli in the anterior and two heli in the posterior row; phobae (PH) present; many sensilla in front of crepis (CR). Claws (unguli) as in *Cnemarachis*.

Raster (fig. 16) without septula and without pali. Tegilla (TL) on left and right side united into a continuous patch (teges) of flat, curved, terminally hooked setae (TG); the setae of a medium irregular group, numbering about 9 to about 15, are much stronger than the rest (as in the species *Cnemarachis suturalis* and *Cnemarachis dissimilis*).

Spiracles as in *Cnemarachis*.

LARVA OF THE GENOTYPE CLEMORA SMITHI (ARROW)

The material on which the following specific description is based is in the U. S. National Museum and consists of:

1. *Clemora smithi* (Arrow) cast larval skins and reared adult, received through the assistance of W. H. Edwards, Jamaica, from R. W. Tucker, Barbados, February 10, 1938.

2. *Clemora smithi* (Arrow) several larvae taken at base of roots of sugarcane, Duncans, Jamaica, collected by W. H. Edwards, December 21, 1937.

Length of mature larva about 50 mm. Extreme width of cranium 6 mm., length (clypeus and labrum excluded) 4.5 mm.; cranium very finely reticulate, shining yellowish brown (in alcohol) with numerous minute sensilla. Epipharynx (fig. 15) with sensilla interspersed between the setae of both chaetopariae (*C*), but more numerous on right side; space in front of crepis (*CR*) with two larger and more than 35 smaller sensilla; about five sensilla behind inner end of dextiotorma. About 15 setae in the median group of strong setae in raster (fig. 16).

LARVAE OF *CLEMORA APICALIS* (BLANCHARD) (?) AND AN
UNDETERMINED SPECIES OF *CLEMORA* FROM CUBA

In addition to the larvae of *Clemora smithi* (Arrow), the U. S. National Museum possesses a few specimens of a species of *Clemora* from roots of banana in Haiti. The species is probably *Clemora apicalis* (Blanchard). The larvae were collected by Arnault Haspil but are not associated with reared adults. These larvae have only about 15 sensilla in front of crepis, while *Clemora smithi* has more than 35, but otherwise they cannot be separated from the latter species by any character.

An undetermined larva in the U. S. National Museum from Santiago de Cuba was collected on February 20, 1908, by E. A. Brooks near a rosebush. It agrees completely with the larva of *Clemora apicalis* (Blanchard) (?) from Haiti, except that there are only 9 strong setae medianly in raster, and not about 15 as there are in both *C. apicalis* (?) and *C. smithi*.

LARVAE OF SOME EXOTIC MELOLONTHINAE

The following synoptic key has been prepared mainly in order to characterize and separate the larvae of the genera of Melolonthini present in the collection of beetle larvae in the U. S. National Museum, but I have also included in the key some species from Korea, notably of the genera *Ancylonycha* and *Apogonia*, described and carefully figured by J. Murayama,⁴ and several species from India and three species from Italy, described and figured, respectively, by J. C. M. Gardner,⁵ Forest Research Institute, Dehra Dun, and Guido Grandi,⁶ University of Bologna, in their usual masterly way. These species, which I never have had an opportunity to examine, have been added for different reasons: *Apogonia cupreoviridis* Kolbe, *Apogonia villosella* Blanchard, *Apogonia cribricollis* Burmeister, *Brahmina coriacea* Hope, and *Granida albosparsa* Moser, because they represent genera of Melolonthini not found in the U. S. National

⁴ Forest Exp. Stat. Chosen Bull. 11, 1931.

⁵ Indian Forest Rec., new ser., Entomology, vol. 1, No. 1, 1935.

⁶ Portici Scuola Sup. Agr. Lab. Zool. Gen. Agr. Bol., vol. 18, 1925.

Museum; *Ancylonycha titanis* Reitter, *Ancylonycha morosa* Waterhouse, and *Ancylonycha diomphalia* Bates, primarily because only one of these species, viz, *titanis*, agrees generically with *Ancylonycha mindanaona* Brenske from Guam, of which the Museum has many specimens. The larvae of *morosa* and *diomphalia*, while congeneric inter se, are so different from *titanis* and *mindanaona* that the genus *Ancylonycha* apparently must be split into two subgenera or possibly genera.¹

SYNOPTIC KEY*

1. Mandibular stridulatory zone distinct, located near middle of ventro-exterior mandibular surface, oblique, composed of numerous densely set, minute, granular tubercles in no order and forming no pattern (fig. 2); galea with a strong seta-bearing dorsobasal tooth (PRC, fig. 5). [About 7 setae on each side along anterior margin of frons; proplegmata absent; epizygum and zygom absent; number of sensilla in front of crepis about 12 (fig. 1); basal article of labial palpus about as long as distal; septula (SEP, fig. 3) longitudinal with parallel sides; pal (PA, fig. 3) short, slightly hooked, in a row of 20 to 28 on each side, extending about half the length of tegilla in front of this patch of setae; preseptular setae absent.]

Melolontha melolontha Linnaeus²

Mandibular stridulatory zone absent or not distinct; galea without dorsobasal tooth..... 2

- 2 (1). Pal either present and arranged in two oblique, posteriorly strongly diverging series, or in a pair of mustachelike patches, or absent.... 3
 - Pal present, usually arranged in a single longitudinal row, or sometimes in two or more longitudinal rows, on each side..... 9

- 3 (2). Pal present..... 4
 - Pal absent..... 5

- 4 (3). Maxillary stridulatory teeth short, present in the number of about 6, distinct and a few indistinct; proplegmata absent; heli 3 or 4, exceptionally 5. [Stipes with a large membranous prolongation between lacinia and galea on the dorsal side, a character discovered by Murayama; anal slit angulate, sagittally with a long cleft; either, in genus *Apogonia*, with pal arranged in two oblique posteriorly strongly diverging series and anterior to these with scattered tegillar setae or, in genus *Diplotaxis*, with pal arranged in a pair of mustachelike patches, and anterior to these with few or no tegillar setae.]

Apogonia cupreoviridis Kolbe (Korea)

A. cribricollis Burmeister (Dehra Dun, India)

A. villosella Blanchard (Dehra Dun, India)

Diplotaxis sordida Say (New Jersey)

D. brevicollis LeConte (Colorado)

¹ For related remarks see Murayama, *loc. cit.*, pp. 82, 86.

² Besides the strictly alternative characters in the key, others guiding and descriptive, but not necessarily alternative, are given in brackets.

³ The following other species of the genus *Melolontha* have been described: *M. virescens* Brenske and *furoicaudata* Ancy, both from India, by J. C. M. Gardner, and *incana* Motschulsky, from Korea, by Joso Murayama. *M. virescens* is mentioned as having 20-28 pal on each side, *furoicaudata* about 27, and *incana* about 20. Pal not always extending in front of tegilla, but the other characters given by both authors in describing their species

Maxillary stridulatory teeth moderately long, numbering 9-13; proplegmata about 10; heli about 7. [Pali in two medianly meeting, posteriorly strongly diverging series, and anterior to these with about 12 tegillar setae on each side and nearer the anterior margin of the segment with very long, thin, straight setae.]

Haplidia etrusca Kraatz (Italy)

- 5 (3). Anterior margin of frons with two or less setae on each side.

Ancylonycha morosa Waterhouse (Korea)

A. diomphalia Bates (Korea)

Anterior margin of frons with four or more setae on each side----- 6

- 6 (5). Proplegmata numerous (about 30). [Epizygum either distinct and connected with zygom, or indistinct; number of heli about 7; tegillar setae flat, curved, and terminally hooked]----- 7

Proplegmata absent----- 8

- 7 (6). Teges (i. e., the medianly united tegilla) with all setae alike. [Chaetopariae without sensilla in *vandinei*, sensilla in front of crepis numbering about 10 in *vandinei*, or more in other species.] (Figs. 13, 14, 19, 20)----- *Cnemarachis vandinei* (Smyth) (Puerto Rico, West Indies)

C. neglecta (Blanchard) (Puerto Rico)

C. portoricensis (Smyth) (?) (Puerto Rico)

(possibly) *Microtrichia cotesi* Brenske (Dehra Dun, India)

Teges with a median longitudinal group of about a dozen setae much stronger than the rest-- *Cnemarachis suturalis* (Chevrolat) (Cuba)

C. dissimilis (Chevrolat) (Cuba)

C. citri (Smyth) (?) (Puerto Rico)

- 8 (6). Zygom fairly distinct; a thin, somewhat crescent-shaped sclerotization present in front of chaetoparia on each side of zygom; number of heli about 7; plegmatium broadly elliptical; many sensilla in front of crepis (about 35 in *C. smithi*, about 15 in *C. apicalis*); teges with a median group of 9 to 15 setae stronger than the rest. [Right chaetoparia with many sensilla, left with comparatively few; distal article of antenna elongate, spindle shaped; anterior margin of frons with long and moderately long setae; disk of frons with two long setae on each side.] (Figs. 15, 16.)

Clemora smithi (Arrow) (Jamaica, Barbados)

C. apicalis (Blanchard) (?) (Haiti)

Zygom vestigial or absent; no sclerotization in front of chaetopariae; number of heli about 15; plegmatium narrow; two sensilla in front of crepis; setae of teges alike in shape and strength. [Chaetopariae without sensilla; distal article on antenna short and thick; anterior margin of frons with numerous moderately long or short setae; disk of frons with numerous moderately long setae.] (Figs. 4, 6, 7.)

Anoxia pilosa Fabricius (Hungary)

A. matutinalis Laporte var. *suturalis* Reitter (Italy)

- 9 (2). Pali arranged in an irregular, rather short row on each side, and a few not paired pali often present in the longitudinal middle line of septula; number of heli about 15. [Zygom very weak; epizygum vestigial, not connected with zygom; plegmatium narrow; sensilla

are identical with those given for *melolontha*. Neither of them mentions any characters pertaining to the epipharynx. It is possible therefore that the character combination as given here for *melolontha* might not apply in toto to all species of the genus *Melolontha*.

- absent in both chaetopariae; right phobae extending almost to zygum; sensilla in front of crepis about 15]----- 10
- Different arrangement of pali; number of heli less than 15----- 11
- 10 (9). Proplegmata very numerous and fine, forming a pair of large, ovate proplegmata; proplegmata separated anteriorly by median, sub-triangular, posteriorly pointing acroparia (figs. 8, 9).
Polyphylla occidentalis (Linnaeus) (Virginia)
 Proplegmata absent---*Polyphylla crinita* LeConte (Oregon, California)
P. variolosa Hentz (Maine, New Jersey)
P. decemlineata Say (Colorado)
 (perhaps) *Granida albosparsa* Moser (Punjab, India)¹⁰
- 11 (9). Anterior margin of frons with about 3 long setae on each side; with anal slit. [Epizygum distinct, connected with zygum; number of heli about 6; chaetopariae without sensilla; 10 or less sensilla in front of crepis; pali 12 to 20 on each side, arranged in a single, anteriorly longitudinal, posteriorly oblique series.]----- 12
- Anterior margin of frons with usually more than three long setae on each side, or with a transverse patch of numerous setae; indistinct or no anal slit. [Chaetopariae with or without sensilla; region in front of crepis with or without sensilla, maxillary articulating skin with or without dark granules; pali straight or hooked; preseptular setae present or absent.]----- 14
- 12 (11). Proplegmata absent; without preseptular setae (according to Grandi).
Rhizotrogus assimilis Herbst var. *obscurus* Brenske (Italy)
 Proplegmata numbering 10 to 15 to each side----- 13
- 13 (12). Without preseptular setae. [Anterior 8 pali short and hooked.]
Rhizotrogus majalis (Razoumowsky) (France; introduced to Newark, N. Y.)
 With 10 or more preseptular setae (figs. 10-12).
Rhizotrogus solstitialis (Linnaeus) (Europe)
- 14 (11). Numerous round black spots on dorsal side of cardo, on coxae, posterior to the spiracles, and on other places.¹¹ [Proplegmata absent; sensilla absent in chaetopariae; sensilla in front of crepis numbering 20 or more; number of heli about 9; mandibular dorsoexterior region without punctures and setae; pali short, straight, dagger shaped, about 20 on each side; number of preseptular setae about 5.] (Figs. 17, 18)-----*Ancylonycha mindanaona* (Brenske) (Guam, Asia)
 Without black spots-----*Ancylonycha titanis* (Reitter) (Korea)
Brahmina coriacea Hope (India)¹²
Phyllophaga spp. (continental America)

¹⁰ According to Gardner's description.

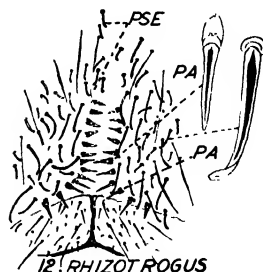
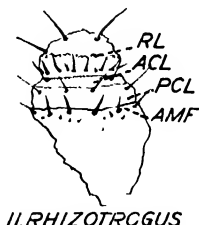
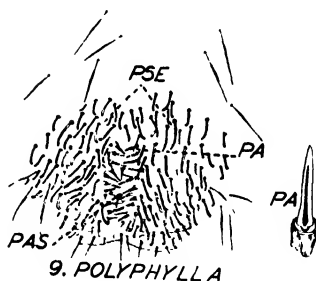
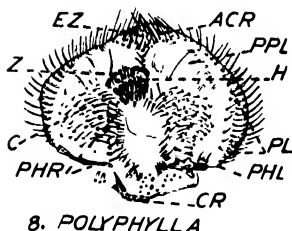
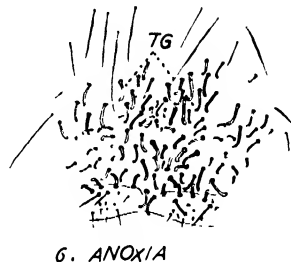
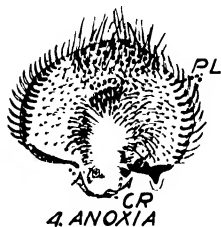
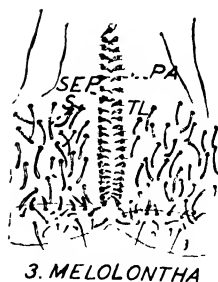
¹¹ Similar black spots, not to be confused with "black granules," are present in the larvae of the species of *Serica* as first drawn, but not described, by Jozo Murayama (*loc. cit.*, pl. 9, fig. 53, b) and also in the larvae of *Oryctetonia jucundo* Falderman (*ibid.*, pl. 10, fig. 69, b).

¹² According to Gardner's description.

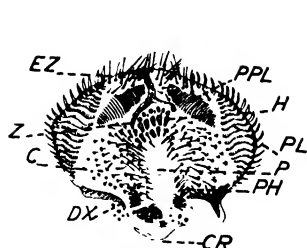
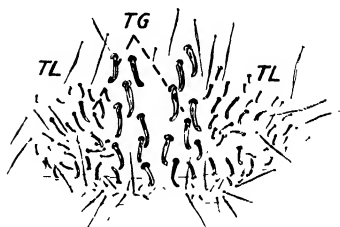
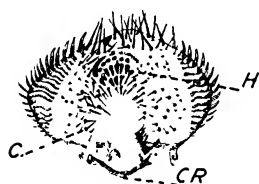
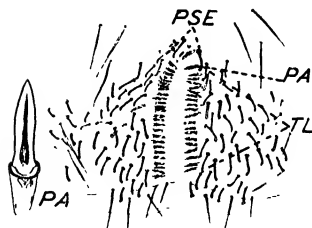
ABBREVIATIONS USED ON PLATES

(All figures drawn by the author)

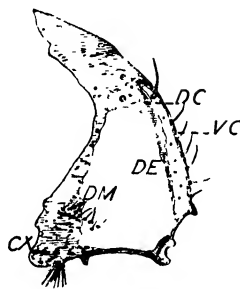
<i>ACL</i>	Anterior part of clypeus.	<i>PHL</i>	Phobae on left side of epipharynx.
<i>ACR</i>	Acroparia.	<i>PHR</i>	Phobae on right side of epipharynx.
<i>AM</i>	Articulating membrane of maxilla.	<i>PL</i>	Plegmatium.
<i>AMF</i>	Anterior margin of frons.	<i>PPL</i>	Proplegmatium.
<i>C</i>	Chaetoparia.	<i>PR</i>	Process on top of third antennal article.
<i>CA</i>	Cardo.	<i>PRC</i>	Process with seta on dorsal side of galea.
<i>CR</i>	Crepis.	<i>PSE</i>	Preseptular setae.
<i>CX</i>	Calx.	<i>RL</i>	Transverse ridge of labrum.
<i>D</i>	Stridulating tooth on dorsal side of stipes.	<i>S</i>	Seta.
<i>DC</i>	Dorsolateral carina of mandible.	<i>SCL</i>	Sclerome.
<i>DE</i>	Dorsoexterior region of mandible.	<i>SEP</i>	Septula.
<i>DM</i>	Dorsomolar region of mandible.	<i>ST</i>	Stipes.
<i>DX</i>	Dexiotorma.	<i>SZ</i>	Stridulating zone.
<i>EZ</i>	Epizygum.	<i>TG</i>	Teges.
<i>H</i>	Helus.	<i>TL</i>	Tegillum.
<i>P</i>	Pedium.	<i>VC</i>	Ventrolateral carina of mandible.
<i>PA</i>	Palus.	<i>Z</i>	Zygum.
<i>PAS</i>	Single palus placed in septula.	<i>3</i>	Third or penultimate article of antenna.
<i>PCL</i>	Posterior part of clypeus.	<i>4</i>	Fourth or distal article of antenna.
<i>PH</i>	Phoba.		



- 1-3, 5, *Melolontha melolontha* (Linnaeus): 1, Epipharynx; 2, part of right mandible (ventral); 3, raster; 3A, two pali; 3B, tegillar seta; 5, maxillary stipes with lacinia and galea (dorsal).
 4, 6, 7, *Anoxia pilosa* (Fabricius): 4, Epipharynx; 6, raster; 7, anterior margin of frons; 7A, subapical (3) and apical (4) articles of antenna (dorsal); 7B, subapical (3) and apical (4) articles of antenna (ventral).
 8, 9, *Polyphylla occidentalis* (Linnaeus): 8, Epipharynx; 9, raster.
 10-12, *Rhizotrogus solstitialis* (Linnaeus): 10, Epipharynx; 11, part of labrum, clypeus, and frons; 12, raster, one enlarged palus, and one enlarged tegillar seta.

13. *CNEMARACHIS*14. *CNEMARACHIS*15. *CLEMORA*16. *CLEMORA*17. *ANCYLONYCHA*18. *ANCYLONYCHA*

18A.

20. *CNEMARACHIS*

18B.



18C.

- 13, 14, *Cnemarachis vandinei* (Smyth): 13, Epipharynx; 14, raster and one enlarged teillgar seta.
- 15, 16, *Clemora smithi* (Arrow): 15, Epipharynx; 16, raster.
- 17, 18, *Ancylonycha mindanaona* (Brenske): 17, Epipharynx; 18, raster and one enlarged palus; 18A, base of coxa with black dots; 18B, black dots posterior to spiracles of fifth and sixth abdominal segments; 18C, base of right maxilla, showing maxillary articulating membrane, cardo with black dots, and part of stipes (dorsal).
- 19, 20, *Cnemarachis vandinei* (Smyth): 19, Base of right maxillary articulating membrane, cardo, and part of stipes (dorsal); 20, right mandible (dorsal).



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NEW SPECIES OF BARK BEETLES (PITYOPHTHORINI)
FROM MEXICO AND TROPICAL AMERICA (COLEOP-
TERA, SCOLYTIDAE)

By M. W. BLACKMAN

For many years specimens of Neotropical Pityophthorini have been accumulating in the National Museum. Many of these were recognized as belonging to undescribed genera and species, but other duties have, until recently, prevented a thorough study of these interesting forms. In the meantime several authors have described most of the new genera and several of the new species. The genera with which we are concerned in this paper are *Thamnophthorus* Schedl, *Neodryocoetes* Eggers, *Neopityophthorus* Schedl, *Myeloborus* Blackman, *Spermophthorus* Costa Lima, *Pityoborus* Blackman, *Pityophthorus* Eichhoff, *Gnathotrichus* Eichhoff, and the new genus *Pityophthoroides* described herein.

Of the 43 new species described in this paper, 13 are based upon specimens collected by Dr. Donald DeLeon in Mexico during January and February 1936; 8 upon specimens taken by Dr. E. A. Schwarz in Mexico, Central America, and Cuba; 12 on specimens intercepted by inspectors of the Bureau of Entomology and Plant Quarantine; 2 on specimens taken by August Busck in Panama; 1 each on specimens taken by J. D. Hood, H. G. Hubbard, H. F. Dietz, R. C. Shannon, R. P. Roba, and A. Fenyès; while two species are based on specimens taken by collectors of which we have no record.

Just as in North Temperate regions, species of *Pityophthorus* Eichhoff breed in the bark (occasionally in the pith) of either coniferous or broadleaf trees, as instanced by many species. *Pityoborus* Blackman, as instanced by *P. tertius*, new species, from Mexico, breeds in the bark of pine. *Pityophilus* Blackman is not yet known from the Neotropics.

Pseudopityophthorus Swaine breeds in the bark of broadleaf trees. *Myeloborus* Blackman breeds in the small twigs of pines. *Conophthorus* Hopkins breeds in the cones of pines. *Gnathotrichus* Eichhoff lives as an ambrosia beetle in the wood of conifers.

So far as known the habits of the genera peculiar to tropical America are as follows: The two known species of *Pityophthoroides*, new genus, breed in the bark of deciduous trees or shrubs. The two known species of the genus *Spermophthorus* Costa Lima breed in the seeds of Caesalpiniaceae. *Thamnophthorus* Schedl (as represented by *T. schwarzi*, new species) breeds in the seeds of *Persea* spp. of the family Lauraceae. All species of the typical *Neodryocoetes* Eggers and also some of the subgenus *Neopityophthorus* Schedl are found in the seeds or pods of various members of the families Asclepiadaceae, Sterculaceae, Palmaceae, Fabaceae, Leguminosae, and Caesalpiniaceae. One species of the subgenus *Neopityophthorus* Schedl was taken on several occasions from the bark of unidentified wood used in shipping crates. It is very probable that several species of this subgenus will be found to breed in bark, and it is not at all improbable that some species of *Neodryocoetes* s. str. may also be found in such material.

Genus THAMNOPHTHORUS Schedl

Thamnophthorus SCHEDL, Arch. für Naturg., vol. 7, p. 174, 1938.

No genotype is indicated, but the author described three species, *Thamnophthorus linearis* Schedl, *T. volastos* Schedl, and *T. nudus* Schedl. *T. volastos* Schedl is hereby designated as the genotype.

THAMNOPHTHORUS SCHWARZI, new species

PLATE 20, FIGURES 1, 2

Female.—Piceous-black, with elytra piceous-brown, shining; 2.43 mm. long, 2.41 times as long as wide.

Frons mostly concealed in type, but dissected paratype with frons transversely flattened, subconclave between upper angles of eyes, subopaque, very finely and densely punctured, with fine, short hairs, median line shining, not carinate; epistomal region in middle third elevated and shining. Eye moderately large, rather coarsely faceted, inner border rather widely, not deeply emarginate. Antenna (fig. 1) with club and scape nearly equal in length, funiculus slightly less than half as long as either; club irregularly obovate, nearly 1.5 times as long as wide, first suture notched on upper border, strongly, diagonally septate on upper half, lower half with no indication of annulation, septum, or setal row.

Pronotum nearly exactly as wide as long, widest at base, which is margined and feebly arcuate, posterior angles somewhat rounded,

sides with posterior third nearly straight or feebly arcuate, distinctly converging, then strongly, arcuately narrowed and constricted, rather narrowly rounded in front, with margin indefinitely serrate; dorsal contour nearly evenly arcuate from base to apex, without hump or transverse impression; anterior half and sides with subconcentric rows of very low, wide asperities, extending nearly to base at sides, posterior disk with distinct punctures and fine granules; median line wide, impunctate, scarcely elevated; hairs very short and fine on posterior disk, longer and coarser on sides and anterior area.

Elytra slightly wider than pronotum and 1.67 times as long, 1.56 times as long as wide, widest behind middle; sides subparallel, moderately narrowly rounded behind; surface brightly shining, stria punctures moderately coarse, in irregular rows, only the first stria impressed; interspaces flat, somewhat rugulose, punctures similar to those of striae but less numerous; sides with punctures more or less confused; vestiture scanty. Declivity sloping, shallowly sulcate at each side of the moderately elevated suture; first stria rather strongly impressed, punctures obsolescent; second stria slightly impressed, these and intervening second interspace forming a sulcus at each side; lateral elevations moderately high, finely, rather roughly punctured; vestiture of rather sparse, moderately short hairs.

Male.—Slightly smaller and stouter (2.07 mm. long, 2.3 times as long as wide); frons convex, shining, roughly but finely punctured, feebly, transversely impressed well above epistoma; pronotum more strongly constricted in front of middle, with asperities slightly stronger; elytral declivity with sulci narrower and deeper and lateral elevations higher than in female.

Type locality.—Boquete, Panama.

Additional locality.—San José, Costa Rica; Queretaro, Mexico.

Host.—Seeds of *Persea pittieri* and *P. americana*.

Type material.—Holotype, allotype, and 17 paratypes, U.S.N.M. No. 55998.

The holotype, allotype, and 5 paratypes bear the labels "Ex seed *Persea* n. sp., Boquete, Panama, E. A. Schwarz, collector"; 2 paratypes, "Collected in seeds of *Persea pittieri*, from San José, Costa Rica; Washington, at quarantine, May 6, 1914, E. R. Sasser, collector"; 10 paratypes obtained from seeds of avocado, from Queretaro, Mexico, by J. D. Neuls, October 10, 1912.

Genus NEODRYOCOETES Eggers

Neodryocoetes EGGER, Trav. Lab. Ent. Mus. Nat. Hist. Nat. Paris, Mem. orig. 1, p. 9, 1933; Rev. Ent., vol. 6, pp. 388-392, 1936.—SCHMIDT, Arch. für Naturg., vol. 7, pp. 177-180, 1938; Anal. Esc. Nac. Cienc. Biol. México, vol. 1, p. 346, 1940. (Genotype, *Neodryocoetes hymenaeae* Eggers. Monobasic.).

Neopityophthorus SCHEDL, Arch. für Naturg., vol. 7, pp. 180-182, 1938; Anal. Esc. Nac. Cienc. Biol. México, vol. 1, pp. 346-347, 1940. (No genotype designated.)

The genus *Neodryocoetes* Eggers contains beetles allied to *Conophthorus*, with cylindrical body, weakly sculptured pronotum and elytra, the latter having setal rows on the interspaces in the posterior half only; head convex, eyes large, coarsely faceted, emarginate; antenna with 5-segmented funicle, club obovate with first suture notched at sides, with row of setae and strong septum, incomplete at center, second and third sutures indicated only by strongly arcuate rows of setae; pronotum evenly arched, without hump, with anterior half finely and densely asperate, posterior half finely punctured, margined at sides and base; elytra finely punctured in rows, declivity weakly to strongly arched, without especial modifications.

Schedl's genus *Neopityophthorus* is described as usually rather shining, stout to slender; antennal club short oval to circular, the notch and septate suture similar to that in *Neodryocoetes*, the septum not so strongly developed and not so strongly arcuate; pronotum like *Pityophthorus* with summit and transverse impression; elytra cylindrical, usually strongly shining, finely sculptured, declivity arched to weakly impressed.

The writer is acquainted with 18 species in the combined *Neodryocoetes-Neopityophthorus* group, 15 of which had never been previously described. A number of these species fall readily in one or the other of the groups, but others do not fit readily in either group. For instance, the antennal club of *cubensis*, new species, resembles more closely the structure characteristic of *Neodryocoetes*, but the pronotum shows very strongly the characters found in species of *Neopityophthorus*. On the other hand, *hostilis*, new species, has an intermediate type of antennal club, while the pronotum is distinctly *Neodryocoetes* as to dorsal contour but intermediate in respect to sculpture. These instances and others which could be readily cited seem to indicate that there is no sufficiently sharp line to justify the segregation of the complex of species into two distinct genera. I believe, therefore, that *Neopityophthorus* Schedl should be considered as no more than a subgenus of *Neodryocoetes* Eggers and am so using it in this paper.

The most reliable characters separating the two subgenera have to do with the dorsal contour and the sculpture of the pronotum. The dorsal line of the pronotum of typical *Neodryocoetes* is evenly arcuate from base to anterior margin, without an elevated summit or transverse impression. The anterior half of the pronotum is usually finely, rather densely asperate with the asperities continued behind the middle, but reduced greatly in size. These reduced asperities often consist of only a slight elevation of the lateral rim of each puncture. In some species even the punctures of the pronotal disk have the lateral rim slightly elevated.

In typical *Neopityophthorus* the pronotum has the summit more or less elevated, with a more or less distinct transverse impression behind it. Both these characters are in some species indistinctly shown, as in *N. schedli*, new species, and *exquisitus*, new species, from Mexico and in *teres*, new species, from Panama Canal Zone. The best character in this group is the absence of asperities or of elevated lateral margins in connection with the punctures on the sides of the posterior half of the pronotum.

Among the true *Neodryocoetes* there are several small species that are very closely related to the type species *hymenaeae* Eggers. All these are less than 2 mm. in length and are similar in habitus, and all live in various tropical seeds. Differences in the structure and vestiture of the frons in both sexes furnish the best diagnostic characters in separating such species as *hymenaeae* Eggers, *amazonicus* Eggers, *caribaeus*, new species, *guianae*, new species, *humilis*, new species, and *hoodi*, new species. Other differences are present, however, and are brought out in the descriptions.

In the following treatment of the species those belonging to *Neodryocoetes* s. str. are *muounae*, new species, *hubbardi*, new species, *columbianus* Schedl, *tabogae*, new species, *caribaeus*, new species, *guianae*, new species, *hoodi*, new species, *humilis*, new species, *hostilis*, new species, and *teres*, new species; while *insularis* (Eggers), *schedli*, new species, *exquisitus*, new species, *tenuis*, new species, *lenis*, new species, *cubensis*, new species, *buscki*, new species, and *pallidus*, new species, belong to the subgenus *Neopityophthorus* Schedl.

NEODRYOCOETES MUCUNAE, new species

PLATE 20, FIGURE 5

Female.—Light reddish brown, with elytra darker reddish brown, 2.26–2.63 mm. long; holotype 2.46 mm. long, 2.38 times as long as wide; allied to *obscurus* Eggers and *hubbardi*, new species.

Frons somewhat flattened below on a semicircular area, opaque to subopaque, very finely and densely punctured, with fine, rather short hairs (shorter than in *hubbardi*); median carina fine but distinctly elevated; upper frons and vertex finely reticulate, subopaque, with sparse, rather fine punctures. Eye large, coarsely faceted, half divided by a deep, rather wide emargination. Antenna (fig. 5) with club broadly obovate, 1.23 times as long as wide, 1.37 times as long as funicle, first suture notched at sides, setose, arcuately, incompletely septate; second and third sutures marked by setae.

Pronotum 1.06 times as long as wide; shape very similar to that of *hubbardi* but anterior margin with less distinct serrations; dorsal contour evenly arcuate; anterior area with irregularly concentric rows of broad, low asperities; posterior area similar to that of *hubbardi*

but showing more of a concentric arrangement of punctures and their accompanying elevated margins; median line not elevated, narrower than in *hubbardi*.

Elytra notably wider behind middle than pronotum at its widest part, and 1.49 times as long, 1.48 times as long as wide; sides very feebly diverging to behind middle, then weakly converging, broadly rounded behind; surface shining, subglabrous on disk; stria rows all irregular (notably more so than in *hubbardi*), the first weakly impressed, the others not impressed; interspaces flat, strongly rugulose, basal third with numerous punctures, distal two-thirds with only occasional punctures on disk; sides with punctures smaller, very strongly rugulose. Declivity moderately sloping, originating well behind middle; not sulcate but with suture slightly elevated and first stria moderately impressed, the others not impressed but consisting of definite rows of punctures; interspaces sparsely punctured, with a few rather short, erect hairs (more numerous than in *hubbardi*).

Male.—Similar in size and proportions; frons convex above, but below with a deep, shining, impunctate, triangular concavity, extending from epistomal margin to level of upper angles of eyes; median carina elevated on lower half of concavity; vestiture of elytral declivity slightly coarser than in female.

Type locality.—Perené River, Peru.

Host.—Seeds of *Mucuna* sp.

Type material.—Holotype, allotype, and five paratypes, U.S.N.M. No. 55999.

The type series was taken from seed of *Mucuna* sp. (parrot bean), Perené River, Peru.

NEODRYOCOETES HUBBARDI, new species

PLATE 20, FIGURES 3, 4

Female.—Light reddish brown; 2.37 mm. long, 2.62 times as long as wide.

Frons convex above, flattened below on an approximate semicircle, subopaque, very finely, closely punctured, with very fine, light-yellow hairs of moderate length; median carina very fine and indistinct; surface subopaque above, very finely reticulate, with sparse, very fine punctures. Eye large, coarsely faceted, nearly half divided by a deep emargination. Antenna (fig. 3) with club obovate, 1.35 times as long as wide, more than one-half longer than funicle; first suture notched at sides, well marked by setae and by a strong, arcuate septum incomplete at center; second and third sutures indicated only by rows of setae.

Pronotum 1.07 times as long as wide, posterior outline weakly arcuate, posterior angles rounded; sides very weakly arcuate on slightly more than posterior half, then arcuately narrowed to the constriction, rather narrowly rounded in front, with anterior margin bearing about 12 to 15 distinct, closely placed serrations, those near median line higher; dorsal contour evenly arcuate from base to apex; anterior area with slightly irregular, concentric rows of very broad, low asperities, continued posteriorly at sides; posterior area subopaque, finely reticulate, finely, shallowly punctured, with lateral rim of each puncture often slightly elevated and shining; median line impunctate, feebly elevated only on posterior sixth, but extending nearly to center.

Elytra not perceptibly wider than pronotum and 1.48 times as long, 1.62 times as long as wide; sides subparallel on anterior two-thirds, then feebly narrowed, very broadly rounded behind; surface moderately shining, glabrous; strial rows all somewhat irregular, only the first rather shallowly impressed; interspaces flat, somewhat reticulate, finely rugulose, with only occasional single punctures; sides similar to disk in sculpture except that seventh and ninth interspaces are convex, and punctures on eighth and ninth striae are somewhat confused. Declivity somewhat sloping, originating well behind middle of elytra; not sulcate but with suture slightly elevated and first stria impressed; other striae in regular rows but not impressed; interspaces finely reticulate, with very few, very fine punctures; vestiture very fine and sparse, with very minute hairs from strial punctures.

Male.—Similar to female in nearly all respects; with frons convex throughout except for shallow, transverse impression just above epistomal margin, frontal punctures slightly coarser and sparser, with very fine, short hairs, median carina fine, interrupted by transverse impression; elytral punctures slightly coarser than in female.

This species is closely allied to *Neodryocoetes obscurus* Eggers from Brazil but differs in several characters brought out in the description.

Type locality.—Kingston, Jamaica.

Host.—Seeds of *Mucuna fawcetti*.

Type material.—Holotype, allotype, and seven paratypes, U.S.N.M. No. 56000.

The holotype, allotype, and five paratypes were taken from the seed of *Mucuna fawcetti*, at Kingston, Jamaica; two paratypes were taken by H. G. Hubbard at Jamaica, West Indies.

NEODRYOCOETES COLUMBIANUS Schedl

PLATE 20, FIGURE 6

Four lots of this species were examined; one from San Vicente, Colombia, collected from cacao by L. M. Murillo; the second lot from

Dept. Santander, Colombia, taken from moldy fruit of *Theobroma cacao* by R. P. Roba; the third lot taken at quarantine, Washington, D. C., by H. L. Sanford, from pods of condurango, originated in Guayaquil, Ecuador; and a single specimen taken by F. J. Dyer in Honduras.

Schedl's otherwise excellent description does not distinguish between the sexes. His description apparently applies to the female with the frons convex, slightly flattened below, very finely, densely punctured, with moderately abundant, fine hairs and a distinct median carina. The frons of the male is neither so finely nor densely punctured, with fewer, much shorter hairs, with the median carina much more distinct on the upper frons and reduced just above the epistoma.

NEODRYOCOETES TABOGAE, new species

PLATE 20, FIGURE 7

Female.—Reddish brown; 1.83 mm. long, 2.67 times as long as wide.

Frons flattened from eye to eye on more than a semicircle, slightly concave at center, weakly shining, very finely, densely punctured, with very fine hairs of moderate length over most of surface, and a sparse border of slightly coarser, much longer hairs at sides and above; median carina represented by an indistinct, indefinite elevation on epistoma. Eye large, rather coarsely faceted, about one-fourth divided by the emargination. Antenna (fig. 7) with club very broadly obovate, 1.16 times as long as wide, first suture notched at sides, strongly arcuate, strongly incompletely septate; second and third sutures marked only by very irregular setal rows.

Pronotum 1.10 times as long as wide, widest at base, posterior outline weakly arcuate, distinctly margined, posterior angles scarcely rounded; sides nearly straight and subparallel on more than posterior half, very feebly constricted in front of middle, broadly rounded in front, anterior margin with fine, broad serrations; dorsal contour evenly arcuate from base to apex; anterior area with small, broad asperities in very irregular, concentric arrangement, extending past middle at sides; with numerous, moderately short, golden-yellow hairs directed toward summit; posterior area moderately shining, finely reticulate, finely, closely punctured, with fine, rather short hairs; median line moderately wide, distinctly elevated, impunctate, extending anteriorly past middle of pronotum.

Elytra scarcely wider than pronotum, 1.62 times as long as wide, 1.50 times as long as pronotum; sides subparallel on anterior half, then very gradually narrowed; broadly rounded behind; surface shining; stria rows nearly entirely regular except near base, only first

stria impressed, punctures rather small; interspaces flat, rugulose, impunctate on disk and sides except near base and declivity; nearly entirely devoid of vestiture except for minute hairs from stria punctures. Declivity moderately steep, originating behind middle of elytra; suture elevated; first stria impressed, with obsolescent punctures; those on other striae somewhat reduced; all interspaces, including the second, sparsely, uniseriately punctured and with a few moderately short, rather stout hairs.

The male is unknown.

Type locality.—Taboga Island, Panama.

Host.—Unknown.

Type material.—Holotype, U.S.N.M. No. 56002.

The holotype was collected on Taboga Island, Republic of Panama, by H. F. Dietz. No other specimen has been seen.

NEODRYOCOETES CARIBAEUS, new species

PLATE 20, FIGURE 11

Female.—Light reddish brown, 1.6–1.91 mm. long; holotype 1.75 mm. long, 2.61 times as long as wide; allied to *hymenaeae* Eggers and *amazonicus* Eggers.

Frons somewhat flattened between eyes, strongly reticulate, punctures shallow, fine, rather close, with very fine, rather short hairs; median carina fine, elevated; vertex less closely punctured, median line broadly impunctate. Eye very large, with facets coarse, nearly half divided by an emargination. Antenna (fig. 11) with club obovate, 1.25 times as long as wide, about 1.45 times as long as funicle, first suture arcuate, strongly, incompletely septate.

Pronotum 1.09 times as long as wide, widest through base, posterior outline arcuate, margined, posterior angles rounded, sides weakly, nearly evenly arcuate from base to weak constriction in front of middle, broadly rounded in front, with anterior margin bearing numerous very small serrations; dorsal contour evenly arcuate from base to apex; anterior area with irregular concentric rows of low, broad asperities; posterior area glabrous, subopaque, its surface finely reticulate, moderately finely, shallowly punctured with outer rims of punctures elevated; median line broad at base, somewhat narrowed anteriorly, impunctate.

Elytra slightly wider than pronotum, 1.61 times as long as wide, 1.58 times as long as pronotum; sides subparallel on anterior two-thirds, moderately rounded behind; surface shining; stria rows slightly irregular, punctures small, rather shallow, only first stria weakly impressed; interspaces rugulose, with a few single, fine punctures; sides confusedly punctured from fifth to seventh interspaces,

seventh and ninth interspaces widened and elevated posteriorly, with a uniseriate row of bristles; eighth narrowed posteriorly. *Declivity* rounded, originating well behind middle; first stria distinctly impressed, others very lightly or not at all impressed; vestiture nearly entirely lacking on anterior half, posterior disk, sides, and declivity with widely spaced, erect, stout, yellowish hairs.

Male.—Very similar to female, but with frons triangularly concave (not so deep as in *guianae*); the concavity shining (not granulate at sides as in *guianae*), finely punctured, and with inconspicuous, short hairs; median carina fine, as in female, elevated, completely bisecting concavity.

Type locality.—Trinidad, British West Indies.

Hosts.—*Hymenaea* sp.; *Erythrina* sp. seed.

Type material.—Holotype, allotype, and 34 paratypes, U.S.N.M. No. 56004.

The holotype, allotype, and 30 paratypes were taken at the Plant Quarantine station, at New Orleans, from the pods of *Hymenaea* sp.; 4 paratypes were intercepted at quarantine, at New York, in seeds of *Erythrina* sp.

NEODRYOCOETES GUIANAE, new species

PLATE 20, FIGURE 12

Female.—Light reddish brown, 1.77–1.94 mm. long; holotype 1.86 mm. long, 2.63 times as long as wide; allied to *caribaeus*, new species, but slightly larger, less shining, and differently sculptured on pronotum and elytra.

Frons flattened below between eyes, finely, very densely punctured, with very fine hairs, longer and more numerous than in *caribaeus*; median carina rather fine, distinctly elevated; vertex subopaque, finely reticulate, shallowly, not closely punctured. Eye very large, with facets coarse, half divided by a deep emargination. Antenna (fig. 12) with club obovate, 1.32 times as long as wide, 1.5 times as long as funicle, first suture notched at sides, arcuate, strongly, incompletely septate; second and third sutures indicated only by setal rows.

Pronotum 1.08 times as long as wide, widest through base, posterior outline arcuate, distinctly margined; sides nearly evenly arcuate from base to anterior lateral constriction, moderately rounded in front (more narrowly than in *caribaeus*), anterior margin scarcely serrate; dorsal contour evenly arcuate from base to apex; anterior area rather weakly asperate; posterior area with surface feebly shining or subopaque, finely reticulate, punctures moderately large and deep (larger and deeper than in *caribaeus*), their outer rims scarcely or not at all elevated; median line impunctate, only feebly elevated.

Elytra wider than pronotum, 1.58 times as long as wide, 1.57 times as long as pronotum; sides subparallel on anterior three-fifths, then arcuately narrowed, moderately narrowly rounded behind; surface weakly shining, stria rows somewhat irregular, punctures rather small, rather shallow, but deeper than in *caribaeus*, only first stria impressed; interspaces reticulate, rugulose, with occasional single punctures; punctures somewhat confused on sides. Declivity with only first stria impressed, vestiture similar to that of *caribaeus* but less abundant.

Male.—Similar to female in habitus; with frons very deeply concave above epistoma, the concavity extending from eye to eye below, and upward to level of upper angle of eye, its sides punctured and distinctly granulate; median carina small, but visible in lower half of concavity; hairs on declivity more conspicuous.

Type locality.—British Guiana.

Additional localities.—Trinidad, British West Indies; Dominican Republic.

Host.—*Cajanus* sp. seeds.

Additional hosts.—*Hymenaea courbaril*, *Ceratonia* sp. seeds.

Type material.—Holotype, allotype, and 29 paratypes, U.S.N.M. No. 56003.

The holotype, allotype, and 12 paratypes were taken at quarantine from seeds of *Cajanus* sp., from British Guiana; 6 paratypes intercepted in seeds of *Hymenaea courbaril* from Trinidad, British West Indies; 11 paratypes intercepted in seeds of *Ceratonia* sp. from Dominican Republic.

NEODRYOCOETES HOODI, new species

PLATE 20, FIGURE 14

Female.—Light reddish brown, with anterior pronotum and elytra darker; 1.58 mm. long, 2.52 times as long as wide; belonging to the *hymenaeae* group.

Frons convex above, only slightly flattened below, with a very fine, elevated, median carina; surface feebly shining, finely and densely punctured, with numerous very fine, rather short hairs (shorter than in *humilis*, new species). Eye large, very coarsely faceted; slightly less than half divided by the emargination. Antenna (fig. 14) with club obovate, 1.43 times as long as wide, 1.50 times as long as funicle; first suture rather strongly arcuate, strongly, not quite completely septate, the others not septate, indicated by setal rows.

Pronotum 1.09 times as long as wide, widest near base, posterior outline arcuate, margined, posterior angles weakly rounded; sides weakly arcuate and converging from base to very feeble anterior lateral constriction, moderately rounded in front, with anterior margin feebly

serrate; dorsal contour evenly arcuate from base to apex, without elevation or transverse impression; anterior area with irregularly concentric rows of low asperities, extending behind middle at sides; posterior area with surface subopaque, very finely reticulate, punctures fine and very shallow, with outer rim of each slightly elevated; median line rather narrow, impunctate, feebly elevated.

Elytra scarcely wider than pronotum, 1.52 times as long as wide, 1.43 times as long as pronotum; sides subparallel on more than anterior half, then arcuately narrowed, with apex moderately broad; surface moderately shining, reticulate; stria rows very irregular on anterior disk; punctures appearing confused, becoming more regular near declivity, only first striae impressed; interspaces weakly rugulose, with a few fine punctures back of middle, each bearing an erect, yellow hair; sides with stria rows slightly irregular. Declivity moderately strongly arched; suture scarcely at all elevated, first stria weakly impressed; first, third, and alternate interspaces with rather short, erect, stout hairs, often club-shaped.

Male.—Similar to female in most particulars; frons convex, shining, finely granulate-punctate between eyes, with a fine, distinctly elevated median carina; hairs short, fine, much sparser than in female.

Type locality.—Taboga Island, Panama.

Host.—Unknown.

Type material.—Holotype, allotype, and seven paratypes, U.S.N.M. No. 56006.

The type series was collected October 16–23, 1913, on Taboga Island, Panama, by J. D. Hood.

NEODRYCOETES HUMILIS, new species

PLATE 20, FIGURE 13

Female.—Reddish brown; 1.54 mm. long, 2.55 times as long as wide; allied to *hymenaeae* Eggers.

Frons moderately shining, convex above, somewhat flattened between eyes, finely and densely punctured, with very fine yellowish hairs of moderate length; median carina fine, but distinct from vertex to epistoma. Eye very large, coarsely faceted, half divided by the emargination. Antenna (fig. 13) with club ovovate, 1.35 times as long as wide, 1.52 times as long as funicle; first suture arcuate, strongly, nearly completely septate.

Pronotum 1.10 times as long as wide, widest through base, posterior outline arcuate, distinctly margined, posterior angles scarcely rounded; sides weakly, convergently arcuate from base to very weak constriction anterior to middle, rather narrowly rounded in front, with anterior

margin weakly serrate; dorsal contour evenly arcuate from base to apex, without elevated summit or posterior impression; anterior area with irregular, concentric rows of low, broad asperities, extending behind middle at sides; posterior area with surface subopaque to weakly shining, finely reticulate, punctures moderately fine and deep, with outer rim of more lateral punctures slightly elevated; median line impunctate, scarcely elevated.

Elytra scarcely wider than pronotum, 1.55 times as long as wide, 1.49 times as long as pronotum; sides straight and subparallel on slightly less than anterior two-thirds, then gradually, arcuately narrowed, with apex moderately broad; surface moderately shining, finely, imperfectly reticulate, striae rows slightly irregular, punctures small, moderately shallow, only first striae impressed; interspaces flat, finely rugulose, with a few punctures, bearing fine, upright, light-colored hairs on disk; sides with striae rows still more irregular. Declivity originating well behind middle; first striae impressed, the others not impressed, suture slightly elevated, devoid of granules, lateral elevations not higher than suture, without granules; each of declivital interspaces with a few conspicuous, light-colored, erect, often stout hairs of moderate length.

Male.—Very similar to female, but with frons convex above, transversely impressed below, with fewer and shorter hairs and sparser punctures.

Type locality.—Bonito, Pernambuco, Brazil.

Host.—Unknown.

Type material.—Holotype and four paratypes, U.S.N.M. No. 56005.

NEODRYOCOETES HOSTILIS, new species

PLATE 20, FIGURE 10

Male.—Dark reddish brown; 2.17 mm. long, 2.58 times as long as wide.

Frons shining, convex above, broadly, transversely impressed below; punctures rather sparse, of moderate size above, smaller, finer, obsolescent below, with short, fine, inconspicuous hairs; median carina on lower half only, very weak. Eye large, coarsely faceted, less than one-third divided by emargination. Antenna (fig. 10) with club obovate, 1.28 times as long as wide; first suture notched at each side, arcuate, with incomplete septum; second suture indicated by row of setae and by notch on upper margin; third suture near distal margin indicated by incomplete row of setae.

Pronotum 1.07 times as long as wide, widest just behind middle, posterior outline arcuate, with definite margin, posterior angles distinctly rounded; sides distinctly arcuate from base to rather strong anterior lateral constriction, rather narrowly rounded in front, front

margin slightly extended and with distinct, rather fine serrations; dorsal contour nearly evenly arcuate, without elevated summit or transverse impression; anterior area with rather dense, irregularly arranged asperities, not extending back of middle at sides; posterior area smooth, shining, glabrous, only faintly reticulate, with punctures small and sparse; median line impunctate, very feebly elevated anteriorly.

Elytra scarcely wider than pronotum, 1.54 times as long as wide, 1.47 times as long as pronotum; sides subparallel on anterior two-thirds, then gradually arcuately narrowed, moderately rounded behind; surface brightly shining; striae rows nearly regular except near base, first striae weakly, the others not at all impressed; interspaces flat, distinctly rugulose, with a few punctures, similar in size to those of striae, hairs few in number, short and inconspicuous except behind. Declivity originating well behind middle, moderately sloping; suture weakly elevated, finely punctured, not granulate; first stria distinctly impressed, punctures scarcely reduced, second stria very feebly impressed; lateral elevations low, no higher than suture; vestiture consisting of short, erect, rather stout, yellowish hairs.

Female.—Similar to male in habitus, with frons flattened from eye to eye, finely, densely punctured, with numerous yellow hairs of moderate length. (The female is represented by only a single broken specimen.)

Type locality.—Unknown.

Host.—*Erythrina cristagalli*.

Type material.—Holotype, allotype, and one paratype, U.S.N.M. No. 56001.

The type series was taken from seeds of *Erythrina cristagalli* in a shipment of seeds from Paris, France, December 3, 1930, at the plant quarantine inspection house at Washington, D. C. The original source of the seeds is unknown.

NEODRYOCOETES TERES, new species

PLATE 21, FIGURE 16

Female.—Piceous-brown; 1.43 mm. long, 2.63 times as long as wide.

Frons shining, flattened between eyes, very finely, very densely punctured, with numerous rather long, fine, yellowish hairs; median line not elevated to form carina. Eye moderately large, facets of moderate size, about one-third divided by the emargination. Antenna (fig. 16) with club broadly obovate, 1.16 times as long as wide, 1.50 times as long as funicle, first suture moderately arcuate, incompletely, not strongly septate; second and third sutures rather indistinctly indicated by setal rows.

Pronotum 1.07 times as long as wide, widest near base, posterior outline feebly arcuate, distinctly margined, posterior angles scarcely

rounded; sides nearly regularly arcuate from base to the moderate anterior lateral constriction, moderately broadly rounded in front, with anterior margin weakly serrate; dorsal contour even, without elevated summit or transverse impression; anterior area with close, low, irregularly arranged asperities, continued at sides well behind middle, with fine, short hairs; posterior area finely, shallowly punctured, usually with lateral rim of each puncture elevated; median line slightly elevated and impunctate, extending from base nearly to middle.

Elytra very slightly wider than pronotum, 1.60 times as long as wide, 1.52 times as long as pronotum; sides very feebly arcuate, broadly rounded behind, conjointly rounded at apex; surface smooth, brightly shining; stria rows fairly regular, only first stria impressed on disk and sides, punctures fine and very shallow; interspaces flat, finely regucose, impunctate on disk and sides, surface reticulate. Declivity moderate; suture wide, slightly elevated, devoid of granules; first stria weakly impressed, its punctures obsolete; lateral elevations low, scarcely higher than low sutures, devoid of granules; apical portion of declivity with a few fine, erect hairs.

Male.—Similar to female in habitus; frons convex above, broadly, transversely impressed between eyes, brightly shining, with punctures sparser and not so fine as in female, median carina weakly developed.

Type locality.—Paraiso, Panama Canal Zone.

Host.—Unknown.

Type material.—Holotype and allotype, U.S.N.M. No. 56007.

The holotype and allotype were collected at Paraiso, Canal Zone, April 26 and January 11, 1911, by E. A. Schwarz.

NEODRYOCOETES CUBENSIS, new species

PLATE 20, FIGURES 8, 9

Female.—Reddish brown, with elytra often darker, 1.51–1.91 mm. long; holotype 1.80 mm. long, 2.42 times as long as wide.

Frons feebly shining, flattened from eye to eye, on nearly circular area, finely, moderately closely punctured, with hairs fine and rather short over most of surface, but with those on margin above level of eyes much longer and slightly coarser, extending nearly to epistoma in a rather thin veil; median carina lacking. Eye very large, coarsely faceted, about one-third divided by emargination. Antenna (fig. 8) with club obovate, 1.36 times as long as wide, 1.80 times as long as funicle; first suture strongly arcuate, strongly, nearly completely septate, second and third more strongly arcuate, not septate, indicated by rows of setae.

Pronotum 1.01 times as long as wide, widest through base, posterior outline feebly arcuate, posterior angles not rounded, sides with posterior half nearly straight and subparallel, then moderately, arcuately

narrowed to the constriction; broadly rounded in front with the margin distinctly serrate; dorsal contour not evenly arcuate, its summit higher than basal portion and separated by a wide, rather deep, transverse impression; anterior area with asperities fused to form 5 (including the marginal serrations) regular, serrate, concentric ridges, with interstices reticulate, finely, sparsely punctured, and with a few fine hairs; posterior area reticulate, moderately shining, with punctures of moderate size and spacing; median line rather wide, impunctate, not elevated.

Elytra not wider than pronotum, 1.46 times as long as wide, 1.46 times as long as pronotum; sides nearly straight and subparallel on anterior half, then arcuately narrowed, moderately rounded behind; surface rather brightly shining; stria rows often irregular, due to crowding, only first striae impressed, punctures moderately coarse; interspaces flat, rugulose, nearly impunctate and subglabrous on disk; sides with stria rows nearly regular, interspaces with only occasional single punctures. Declivity sloping, originating about midway on elytra; suture slightly widened near apex, first stria strongly impressed, its punctures only slightly reduced, punctures of other striae as on disk but more regular; lateral elevations higher than suture, devoid of granules; vestiture very scanty.

Male.—Similar to female in habitus; with frons strongly convex above, transversely impressed above epistoma; surface shining, finely reticulate; sparsely, very finely and shallowly punctured, with a few very fine, very short hairs.

Type locality.—Cayamas, Cuba.

Host.—Unknown.

Type material.—Holotype, allotype, and 24 paratypes, U.S.N.M. No. 56010.

The type series was collected at Cayamas, Cuba, by E. A. Schwarz in January and February.

NEODRYOCOETES BUSCKI, new species

PLATE 21, FIGURE 15

Female.—Light yellowish red (probably somewhat immature); 1.51 mm. long, 2.82 times as long as wide; dorsal surface nearly glabrous except on declivity, ventral surface unusually hairy for the group.

Frons unusually narrow between eyes, distinctly flattened, very finely and densely punctured, with numerous short, very fine hairs of nearly uniform length; median line elevated to form a low, blunt, median carina, impunctate and more shining below on epistoma. Eye very large, very coarsely faceted, less than one-fourth divided by a rather narrow and shallow emargination. Antenna (fig. 15) with club very

broadly ovate, 1.1 times as long as wide, nearly twice as long as funicle; first suture more strongly arcuate, indicated by a row of setae and a slight notch at each side but with weak septum; third suture indicated only by an incomplete row of setae; hairs on both club and funicle longer than usual but often fimbriated.

Pronotum 1.19 times as long as wide, widest at base, posterior outline nearly straight, distinctly margined; posterior angles scarcely rounded; sides nearly straight and very feebly convergent on posterior half, scarcely at all constricted in front of middle, very broadly rounded in front, anterior margin finely serrate; summit low, at middle, feebly, transversely impressed posterior to it; anterior area with numerous low, broad asperities in irregularly concentric arrangement; posterior area shining, finely reticulate, with punctures fine, shallow, and rather sparse; median line scarcely elevated, very narrow at transverse impression; sides nearly devoid of punctures.

Elytra nearly exactly as wide as pronotum and 1.44 times as long, 1.68 times as long as wide; sides straight and subparallel on anterior two-thirds, then gently, arcuately narrowed, moderately rounded behind, not conjointly rounded but emarginate at suture, exposing tip of abdomen; surface brightly shining, finely, indistinctly reticulate; stria rows regular, with punctures fine and shallow, first stria weakly impressed, others not impressed on disk and sides; interspaces flat, impunctate, and devoid of hairs. Declivity moderately sloping, originating well behind middle; suture distinctly elevated, with a few moderate granules; first stria impressed, its punctures obsolescent; lateral elevations not so high as suture, finely granulate on third and more lateral interspaces, with numerous fine, moderately short, erect hairs.

Male.—Similar to female in habitus, but with frons more coarsely punctured, and with fewer, coarser hairs; elytral declivity with coarser granules and longer, coarser hairs.

Type locality.—Cabima, Panama.

Host.—Unknown.

Type material.—Holotype, allotype, and two paratypes, U. S. N. M. No. 56008.

The type series was collected at Cabima, Panama, May 21, 22, and 25, 1911, by August Busck.

NEODRYOCOETES PALLIDUS, new species

PLATE 21, FIGURE 17

Female.—Yellowish red (somewhat immature) with the elytra paler except at apex; 1.77 mm. long, 2.69 times as long as wide.

Frons strongly convex above eyes, lunately impressed between eyes; punctures rough and of moderate size above, fine and rather dense

below, with short, fine, inconspicuous hairs, without distinct median carina. Eye large, coarsely faceted, less than one-third divided by an emargination. Antenna (fig. 17) with club very broad oval, nearly as wide as long, 1.5 times as long as funicle; first suture moderately arcuate, the septum rather weak; second and third sutures indicated only by arcuate setal rows.

Pronotum 1.11 times as long as wide, widest at base, posterior margin scarcely arcuate, posterior angles slightly rounded; sides straight and subparallel on posterior half, arcuately narrowed to the constriction, broadly rounded in front; anterior margin finely but distinctly serrate; dorsal contour not evenly arcuate, its summit scarcely elevated, with surface posterior to it broadly, very shallowly impressed; anterior area with moderate-sized asperities not arranged in regular concentric rows; posterior area subopaque, densely, finely granulate-punctate in transverse impression, finely and rather roughly punctured behind, median line indistinct.

Elytra equal in width to pronotum, 1.65 times as long as wide, 1.5 times as long as pronotum; sides nearly straight and subparallel on anterior two-thirds, moderately rounded behind; surface faintly reticulate, shining; stria punctures of moderate size, in regular stria rows, only the first impressed; interspaces scarcely rugulose, impunctate on disk except in first interspace near declivity; sides with regular stria rows and without hairs except near ventral border. Declivity moderately sloping, originating well behind middle; suture elevated; with fine granules, first stria rather strongly impressed, its punctures obsolescent, those of second stria obsolete; lateral elevations slightly higher than suture, with a few minute granules; all of interspaces except second punctured and bearing short, erect, rather stout hairs.

Male.—Similar to female in habitus, with frons more strongly convex, transversely impressed only just above epistomal margin, with punctures much sparser than in female and with much fewer, shorter hairs.

Type locality.—Cayamas, Cuba.

Host.—Unknown.

Type material.—Holotype, allotype, and one paratype, U.S.N.M. No. 56009.

The short type series was collected by E. A. Schwarz at Cayamas, Cuba, in May and June.

NEODRYOCOETES INSULARIS (Eggers)

PLATE 21, FIGURE 19

This species was described from Guadaloupe as of the genus *Pityophthorus* by Eggers in 1925. In 1936 (Rev. Ent., vol. 6, p. 390) Eggers placed it in *Neodryocoetes* Eggers. Schedl in 1938 (Arch.

für Naturg., vol. 7, p. 180) placed it in his newly described genus *Neopityophthorus* Schedl and described a new variety from Costa Rica.

In addition to two paratypes received from Eggers, the writer has studied two lots taken at quarantine and totaling 36 specimens. Of these, 13 specimens came from Jamaica in seeds of *Brownea* sp. and 23 were shipped from Dutch Guiana in seeds of *Euterpe oleracea*.

NEODRYOCOETES SCHEDL, new species

PLATE 21, FIGURE 20

Male.—Reddish brown, with anterior fourth of pronotum piceous-brown; 1.26 mm. long, 2.44 times as long as wide.

Frons convex above, somewhat flattened below, rather finely and closely roughly punctured, with fine, short hairs, those on epistoma longer and directed downward; with faint indications of a median carina. Eye rather large, with moderate facets, emargination rather shallow. Antenna (fig. 20) with club 1.45 times as long as funicle, 1.38 times as long as wide; first suture notched at sides, weakly arcuate, partially septate; second and third sutures strongly arcuate, indicated by rows of setae.

Pronotum almost exactly as long as wide, widest near posterior angles; posterior border margined, feebly arcuate; sides nearly straight and subparallel on posterior third, then arcuately narrowed, constricted in front of middle, moderately narrowly rounded in front, anterior margin with about 8 serrations, the median ones distinctly longer; contour of disk as seen from side almost evenly convex, the summit low, and posterior impression seen only at each side of median line and there indistinctly; anterior area with asperities in irregularly concentric rows near summit, but with the first row behind margin fused to form a nearly regular serrate ridge; posterior area moderately shining, with punctures of moderate size, interstices finely reticulate; median line weakly elevated, wide behind, narrowed anteriorly; pronotum nearly glabrous.

Elytra slightly wider than pronotum and 1.78 times as long, about 1.47 times as long as wide; sides subparallel, very feebly arcuate on anterior two-thirds, moderately rounded behind; surface reddish brown, moderately shining; punctures rather small, in nearly regular stria rows, the first row impressed; interspaces flat, very finely rugulose, nearly impunctate; vestiture minute on sides, minute and very scanty on disk. Declivity arched, without sulcus; suture weakly elevated, not granulate, first stria no more strongly impressed than on disk, punctures slightly smaller than those on disk, hairs only slightly longer and more numerous than on sides.

Female.—Similar in habitus to male, but distinctly larger (1.51 mm. long); frons flattened from eye to eye on a nearly circular area, very finely, closely punctured, with long, fine yellow hairs, those from periphery longer and curved inward, concealing much of surface.

Type locality.—Tampico, Mexico.

Host.—Unknown.

Type material.—Holotype, allotype, and one paratype, U.S.N.M. No. 55976.

Described from a single female and two male specimens taken at Tampico, Mexico, December 26, 1909, by E. A. Schwarz.

NEODRYOCOETES EXQUISITUS, new species

PLATE 21, FIGURES 21, 21a

Female.—Piceous-black, shining; 1.41 mm. long, 2.75 times as long as wide.

Frons concave between eyes, probably with concavity finely, closely punctured, but surface normally completely hidden by dense, long, shining, yellow hairs, extending downward from above and sides nearly to the epistomal margin, peripheral margin indented and very finely and closely punctured. Eye rather large, with moderate facets, about one-third divided by a rather broad emargination. Antenna (fig. 21) with club about 1.5 as long as 5-segmented funicle; first suture notched at sides, partially septate, septum only feebly arcuate; second and third sutures indistinct, indicated only by incomplete rows of setae.

Pronotum 1.14 times as long as wide, widest behind; posterior border margined, weakly arcuate, sides very feebly arcuate, subparallel on posterior half, distinctly constricted in front of middle, moderately narrowly rounded in front, with four to six serrations, median pair slightly longer; contour of disk as seen from sides nearly evenly convex, the summit therefore scarcely elevated and the posterior transverse impression nearly absent; anterior area with slightly irregular, concentric rows of low asperities; posterior area shining, with moderately coarse, close, deep punctures, interstices distinctly, finely reticulate; median line of moderate width, slightly elevated; appearing glabrous, but with minute hairs.

Elytra slightly wider than pronotum and 1.63 times as long, about 1.72 times as long as wide, sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface piceous black, brightly shining; stria punctures in nearly regular rows, only the first row impressed; interspaces narrow, finely rugulose, almost entirely impunctate; vestiture consisting of minute hairs from stria punctures and a few slightly larger ones from interspaces. Declivity moderately arched, not truly sulcate, but with suture slightly elevated, first stria impressed, with punctures smaller than those on disk; second

interspace not below level of third; declivity with fine, short hairs; declivity without granules.

Male.—Similar to female in habitus; frons convex, feebly transversely impressed above epistoma, rather finely but roughly punctured, with a median fine, indistinct carina originating in a median elevation above on vertex; frontal hairs short and fine; sculpture and vestiture of pronotum and elytra similar to those of female.

Type locality.—Mexico.

Host.—Unknown.

Type material.—Holotype, allotype, and 43 paratypes, U.S.N.M. No. 55977.

Holotype, allotype, and 43 paratypes taken at quarantine stations from bark of unknown crate wood from Mexico.

NEODRYOCOETES TENUIS, new species

PLATE 21, FIGURE 23

Female.—Reddish brown; 1.74 mm. long, 3.02 times as long as wide; subglabrous as seen from above except on declivity.

Frons convex above, distinctly flattened below on semicircular area, surface finely, densely punctured, with fine, moderately long hairs of nearly even length; median line elevated into a broad, low carina, impunctate and brightly shining. Eye rather large, the facets moderate, emargination rather wide and shallow. Antenna (fig. 23) with club obovate, 1.3 times as long as wide, 1.68 times as long as funicle; first suture notched at sides, with a strong but incomplete, arcuate septum; second and third sutures indicated only by arcuate setal rows.

Pronotum 1.19 times as long as wide, widest behind middle, posterior outline feebly arcuate, distinctly margined; posterior angles scarcely rounded, sides feebly arcuate on more than posterior half, then very feebly constricted well in front of middle, very broadly rounded in front, anterior margin with numerous fine serrations; dorsal contour nearly evenly convex, with summit low, well in front of middle, scarcely at all impressed posterior to it; anterior area with numerous rather low, broad asperities in somewhat irregular, concentric rows; posterior area moderately shining, finely reticulate, with deep, moderate-sized punctures, rather sparsely arranged; median line rather broad, impunctate, slightly elevated, extending from base to middle of pronotum.

Elytra scarcely at all wider than pronotum, and 1.63 times as long, 1.94 times as long as wide; sides straight and subparallel on anterior three-fourths, moderately narrowly rounded at apex; surface shining; striae regular on disk, only the first impressed, punctures rather

fine, moderately close; interspaces flat, impunctate on disk and sides, finely rugulose; disk and sides glabrous except for very minute hairs from strial punctures. Declivity steep, suture elevated, first striae more strongly impressed than on disk, with punctures reduced; lateral elevations no higher than suture, interspaces not granulate, finely punctured, with rather numerous, rather short, erect, yellow hairs.

The male is unknown.

Type locality.—Tampico, Mexico.

Host.—Unknown.

Holotype.—U.S.N.M. No. 55978.

The holotype was taken by E. A. Schwarz at Tampico, Mexico.

NEODRYOCOETES LENIS, new species

PLATE 21, FIGURE 22

Male.—Reddish brown, with summit of pronotum slightly lighter; 1.27 mm. long, 2.69 times as long as wide.

Frons convex above, transversely impressed below, surface brightly shining, very finely, not very closely punctured, with fine, inconspicuous hairs; median carina very feebly indicated. Eye of moderate size, with moderate facets, less than half divided by emargination. Antenna (fig. 22) with club obovate, 1.25 times as long as wide, 1.60 times as long as funicle; first suture moderately arcuate, incompletely, moderately strongly septate, second and third sutures indicated only by imperfect rows of setae.

Pronotum 1.15 times as long as wide, widest at base, posterior outline weakly arcuate, posterior angles feebly rounded; sides nearly straight, feebly arcuate from base to weak constriction anterior to middle, moderately rounded in front, with margin finely, closely serrate; summit low, with transverse impression behind it very shallow; anterior area with asperities arranged in irregularly concentric rows, not extending behind middle at sides; posterior area somewhat shining, finely reticulate, punctures deep, moderate in size and spacing; median line impunctate, not elevated, extending to summit; disk glabrous, anterior area with short, fine hairs.

Elytra scarcely at all wider than pronotum, 1.64 times as long as wide, 1.46 times as long as pronotum; widest near middle, with sides very feebly arcuate, moderately narrowly rounded behind; surface rather weakly shining, finely reticulate; strial rows nearly regular, only first striae impressed and these very slightly, punctures fine, not very deep; interspaces flat, impunctate on disk and sides, glabrous. Declivity evenly arched, suture scarcely more elevated than on disk, first striae very weakly impressed; with only minute hairs and these mostly from strial punctures, devoid of granules.

The female is unknown.

Type locality.—Cordoba, Veracruz, Mexico.

Host.—Unknown.

Holotype.—U.S.N.M. No. 55979.

The holotype was collected at Cordoba, Veracruz, Mexico, April 23, 1908, by A. Fenyes.

PITYOPHTHOROIDES, new genus

Genotype.—*Pityophthoroides pudens*, new species, described herein.

Body elongate cylindrical, resembling *Pseudopityophthorus asperulus* (LeConte) in general habitus; pronotum with summit elevated, posterior area finely punctulate; elytra indistinctly punctulate-striate, declivity normal; fore tibia with three submarginal socketed teeth and several serrations; antenna of the Pityophthorini type, with club distinctly longer than 5-segmented funicle, first two sutures arcuate, notched at each side, with setal rows, but entirely devoid of septa, as in *Conophthorus* Hopkins and *Myeloborus* Blackman.

PITYOPHTHOROIDES PUDENS, new species

PLATE 21, FIGURES 26, 27

Female.—Reddish brown, with summit of pronotum lighter, and apical portion of elytra darker; 1.25 mm. long, 2.84 times as long as wide; superficially resembling *Neodryococtes insularis* (Eggers).

Frons convex above, finely, distinctly reticulate, subopaque, with fine, deep, distinct punctures; flattened below on less than a semicircle, punctures finer and more shallow than above, surface weakly shining, with very fine, moderately long hairs; median line distinctly elevated on vertex and upper frons, rather weak below. Eye of moderate size, facets rather small, about one-third divided by emargination. Antenna (fig. 26) with club 1.33 times as long as wide, 1.60 times as long as funicle; sutures without septa, first and second indicated by notches at sides and incomplete rows of setae, third indicated by setal row.

Pronotum 1.13 times as long as wide, widest behind, posterior outline nearly straight, posterior angles slightly rounded; sides straight and subparallel on posterior half, scarcely constricted in front of middle, broadly rounded in front, with anterior margin strongly, finely serrate; anterior area with rather strong asperities in irregularly concentric rows, not extending behind middle at sides; summit moderately elevated, slightly before middle, transverse impression shallow and indefinite; posterior area moderately shining, finely reticulate, with very fine, shallow, rather sparse punctures; median line not elevated, impunctate; hairs very fine, short, and inconspicuous.

Elytra scarcely wider than pronotum, 1.69 times as long as wide, 1.53 times as long as pronotum; sides subparallel on more than anterior

two-thirds, narrowly rounded behind, not conjointly rounded at apex, but broadly emarginate at suture; surface shining, very finely, indistinctly reticulate; punctures inconspicuous, minute, not in complete, regular rows on disk and sides; interspaces impunctate. Declivity moderately arched, suture feebly elevated, none of striae impressed; interspaces entirely devoid of granules, with minute punctures from which arise conspicuous, erect, stout, cinereous, spatulate hairs.

Male.—Very similar to female in size and habitus; frons slightly more roughly punctured above, transversely impressed below, with hairs less numerous and shorter.

Type locality.—Cayamas, Cuba.

Host.—Unknown.

Type material.—Holotype and 14 paratypes, U.S.N.M. No. 56016.

The type series was taken by E. A. Schwarz at Cayamas, Cuba, during January and February. No host record is available.

PITYOPHTHOROIDES ROBAL, new species

PLATE 21, FIGURE 28

Female.—Very dark reddish brown, with summit of pronotum lighter; larger and slightly stouter than *prudens*.

Frons mostly concealed, convex above, transversely flattened below; surface reticulate, subopaque, moderately punctured above, more finely and closely below, with fine hairs of moderate length. Eye moderately small, with rather small facets, less than half divided by emargination. Antenna (fig. 28) with club 1.24 times as long as wide, 1.37 times as long as funicle; all of sutures arcuate, the first and second notched at sides, none of sutures septate.

Pronotum longer than wide, widest near base, posterior outline nearly straight, angles scarcely rounded; sides nearly straight and subparallel on posterior half, broadly rounded in front, with anterior margin distinctly serrate; anterior area with moderate-sized asperities in irregular, concentric rows, not extending behind middle at sides; summit moderate, transverse impression rather shallow; posterior area shining, faintly reticulate, somewhat rugulose, with very fine, inconspicuous punctures, median line impunctate, not elevated; hairs fine and short.

Elytra slightly wider than pronotum, 1.63 times as long as wide; sides subparallel on more than anterior half, moderately narrowly rounded behind, emarginate at apex of suture; surface faintly reticulate; punctures minute and inconspicuous, in incomplete rows, none of striae impressed on disk and sides; interspaces impunctate and devoid of hairs. Declivity moderately arched, surface feebly shining; striae not impressed, interspaces without granules, with very fine punctures, giving origin to rather conspicuous, short, erect, spatulate bristles.

Type locality.—Dept. Santander, Colombia, South America.

Host.—*Psidium guajava*.

Type material.—Holotype, U.S.N.M. No. 56017.

The holotype was taken from the dried branches of guava (*Psidium guajava*), Dept. Santander, Colombia, at an elevation of 700 to 1,300 meters, by R. P. Roba, in whose honor the species is named.

Genus **MYELOBORUS** Blackman

MYELOBORUS DELEONI, new species

PLATE 22, FIGURES 29-31

Female.—Dark piceous-brown, with elytra and summit of pronotum lighter; 3.07–3.66 mm. long, holotype 3.56 mm. long, about 2.65 times as long as wide; larger than any species previously described.

Frons very wide between eyes, frontal rectangle about 0.4 as long as wide; convex, slightly flattened below, surface brightly shining, finely, moderately sparsely punctured, median carina distinct on epistoma and above level of eyes, often interrupted above epistoma, variable; hairs short and inconspicuous. Eye with moderate facets, half divided by a moderately wide emargination. Antenna (fig. 31) testaceous, with club subequal in length to funicle, widest through second segment, first two sutures strongly annulate, distinctly arcuate, neither septate, third suture faintly indicated by incomplete row of setae.

Pronotum 1.1 times as long as wide, widest posteriorly, posterior outline nearly straight, posterior angles slightly rounded; sides arcuately narrowed to the faint constriction, rather broadly rounded in front, anterior margin with 6 to 8 small serrations; anterior area with many moderately developed asperities in irregularly concentric rows; summit high, with rather strong transverse impression behind it; posterior area shining, rather finely, moderately closely punctured; median line wide, impunctate, slightly elevated; hairs short and inconspicuous.

Elytra slightly wider than pronotum, about 1.6 times as long as wide, widest at about middle, sides subparallel, faintly arcuate on anterior three-fourths, broadly rounded behind; surface light reddish brown, shining; disk with striae, except first, not impressed, punctures moderately coarse, rather close, in irregular rows, especially near base; interspaces flat, somewhat rugulose, the punctures notably smaller and sparse; more numerous and larger on sides; disk subglabrous. Declivity with sulcus of moderate depth and width, stria punctures scarcely smaller than on disk, except in first stria, which is strongly impressed; suture moderately elevated, moderately wide, with only minute vestiges of granules; second interspace not wider than on

disk, impunctate, feebly rugulose; lateral elevations moderate, with a few minute vestigial granules in third interspace; ninth interspace somewhat elevated; hairs short, fine, sparse, and inconspicuous.

Male.—Very similar to female in general habitus; frons scarcely flattened, more strongly punctured than in female; antennal club (fig. 30) narrower than in female; pronotum and elytra slightly more strongly punctured throughout; elytral striae very irregular.

Type locality.—El Seco, Puebla, Mexico.

Host.—*Pinus* sp.

Type material.—Holotype and seven paratypes. U.S.N.M. No. 55975.

Holotype and seven paratypes collected by Donald DeLeon, at El Seco, Puebla, Mexico, from a 5-needled pine, the identity of which was not established.

Genus *PITYOBORUS* Blackman

PITYOBORUS TERTIUS, new species

PLATE 22, FIGURES 32, 33

Female.—Very dark reddish brown; 2.46–2.63 mm. long, holotype 2.54 mm. long, about 2.96 times as long as wide; allied to *secundus* Blackman, but with the patches of plushlike pubescence light yellow and not extending so far posteriorly.

Frons very wide between eyes, frontal rectangle about 0.41 as long as wide; surface piceous-brown, subopaque, finely reticulate, flattened from eye to eye, subconcave in median two-fifths; punctures very fine, rather sparse, confined to outer third at sides and above, with rather sparse, fine moderately long hairs. Eye large, broadly and deeply emarginate, moderately coarsely faceted. Antenna (fig. 32) with club twice as long as funicle, 1.4 times as long as wide.

Pronotum about 1.05 times as long as wide (exclusive of pubescent patches); posterior outline very feebly arcuate, posterior angles rounded, sides weakly arcuate, scarcely constricted before middle, broadly rounded in front, with about 16 moderately fine serrations; anterior area rather sparsely, weakly, irregularly asperate; each side bearing an irregularly ovate patch of light yellow, plushlike pubescence, the posterior limits of which extend barely behind the middle; summit low, at center, transverse impression lacking in median area; posterior area subopaque, finely reticulate, with very fine and shallow punctures and minute hairs; median longitudinal line distinctly elevated, impunctate.

Elytra slightly wider than pronotum, about 1.93 times as long as wide, sides subparallel on anterior two-thirds, then strongly, arcu-

ately narrowed, the 2 sides meeting at suture in an obtuse angle; surface subopaque to feebly shining, reticulate, punctures rather deep and moderately fine, in nearly regular striae rows, only first striae impressed; interspaces with very few, somewhat smaller punctures. Declivity convex, suture rather wide, slightly elevated, with a row of sparse, obsolescent granules; first and second striae with punctures nearly obsolete, first striae impressed; second interspace flat, not depressed, devoid of punctures except near apex; third interspace with granules nearly entirely obsolete. Disk and sides nearly glabrous but with rather conspicuous hairs on declivity.

Male.—Similar in color, size, and general habitus; frons flattened between eyes, the surface subopaque, reticulate, with sparse, small punctures giving rise to a few hairs which are shorter than in female, median line broadly elevated to form a very blunt carina; pronotum similar to that of female, but with the pilose areas lacking, corresponding area slightly depressed, finely sparsely punctured, with a few small asperities on anterior half; elytra similar to those of female, but with the second interspace on declivity very feebly subsulcate.

This species is closely allied to *Pityoborus secundus* Blackman, but is distinguished by the slightly more slender form, the distinctly smaller patch of pronotal pubescence, with its posterior outline nearly straight, and by the weaker development of the declivital sulcus and the granules on both suture and third interspace. *Pityoborus comatus* (Zimmerman) is slightly smaller and stouter than the two more western species.

Type locality.—Chalco, D. F., Mexico.

Host.—*Pinus leiophylla*.

Type material.—Holotype, allotype, and seven paratypes, U.S.N.M. No. 55980.

The type material was collected January 27, 1936, from *Pinus leiophylla*, Chalco, D. F., Mexico, by Donald DeLeon.

Genus SPERMOPHTHORUS Costa Lima

SPERMOPHTHORUS CAESALPINIAE, new species

PLATE 21, FIGURES 24, 25

Female.—Reddish brown; 1.91 mm. long, 2.65 times as long as wide.

Frons flattened at each side of the elevated, rather broad median carina; rather finely, closely punctured, with rather fine, rather short hairs. Eye of moderate size, coarsely faceted, less than a third divided by emargination. Antenna (fig. 25) somewhat similar to those of various *Pityophthorus* but with scape more strongly clavate, funiculus with four distal segments more strongly, progressively widened, and the club relatively smaller; club 1.28 times as long as wide, 1.11 times

as long as funicle, first and second segments together comprising much more than half of length, first and second sutures transverse, partially septate, third suture indicated by row of setae.

Pronotum 1.15 times as long as wide, widest near base, posterior outline weakly arcuate, distinctly margined, posterior angles rounded; sides weakly arcuate from base to anterior lateral constriction, moderately rounded in front, with anterior margin weakly serrate; dorsal contour evenly arcuate from base to apex, without elevated summit or transverse impression; anterior area with asperities in irregularly concentric rows, continued at sides nearly to base; posterior area strongly punctured, usually with lateral rim of each puncture elevated; median line narrow, elevated; vestiture of short, stout hairs, often somewhat spatulate.

Elytra distinctly wider than pronotum, 1.34 times as long as wide, 1.30 times as long as pronotum; sides subparallel on anterior half, then gradually arcuately narrowed, very broadly rounded at apex; surface shining, feebly reticulate; first stria impressed, the punctures in fairly regular rows, rest of disk and sides confusedly punctured, with all punctures about equally deep and coarse, many of them (from interspaces) with short, stout hairs, often spatulate, especially on sides and behind. Declivity sloping, originating slightly behind middle of elytra, distinctly sulcate; suture rather narrow, slightly elevated; first stria strongly, second stria feebly impressed, with intervening second interspace forming fundus of sulcus; lateral elevations much higher than suture, with third and more lateral interspaces strongly punctured and bearing stout, erect, spatulate hairs, not so conspicuous as in *apuleiae* Costa Lima.

Male.—Very similar to female in habitus; frons more shining, less closely punctured, with very small, inconspicuous hairs; median carina more strongly, sharply elevated; elytral declivity with sulcus slightly deeper.

Spermophthorus caesalpiniae is rather closely related to *S. apuleiae* Costa Lima, of which I have a single specimen taken from the seed of *Caesalpinia ferrea* from Brazil. The most easily recognized differences concern the vestiture of the elytra, which in *apuleiae* is more conspicuous, with the individual setae more flattened and scalelike. Differences in the frons, elytral declivity, etc., are also present but are not so conspicuous; also the elytral punctures are in nearly regular rows.

Type locality.—Paraguay.

Host.—*Caesalpinia melanocarpa*.

Type material.—Holotype, allotype, and four paratypes, U.S.N.M. No. 56011.

The type series bears the data labels, "Paraguay, 6054; *Caesalpinia* (sic) *melanocarpa*."

Genus *PITYOPHTHORUS* Eichhoff*PITYOPHTHORUS LEIOPHYLLAE*, new species

PLATE 23, FIGURE 37

Female.—Dark reddish brown; 2.11 mm. long, 2.60 times as long as wide; allied to *scalptor* Blackman, *anceps* Blackman, etc. of Group I.

Frons flattened on more than a semicircle extending from eye to eye, surface shining, very finely, moderately closely punctured at sides and above, polished and impunctate in median line on lower half, with fine, moderately long hairs, those at periphery incurved. Eye with moderate facets, nearly half divided by a rather wide emargination. Antenna (fig. 37) with club oval, 1.2 times as long as wide, almost 1.6 times as long as funicle, widest through third segment, first two segments together less than half total length of club; first suture arcuate, partly septate, second more strongly arcuate, partly septate; third not septate, very strongly arcuate.

Pronotum almost exactly as wide as long, widest in posterior fourth; posterior outline feebly arcuate, strongly margined, posterior angles rounded, sides arcuate on posterior half, distinctly constricted in front of middle, very broadly rounded in front, with anterior margin distinctly serrate; anterior area moderately strongly asperate, with asperities arranged in nearly regular concentric rows; summit moderately high, near middle, with distinct transverse impression behind it; posterior area moderately shining, reticulate, finely, not deeply, somewhat roughly punctured; median line rather narrow, impunctate, not elevated; hairs very small and inconspicuous on disk, slightly larger on sides.

Elytra wider than pronotum, about 1.61 times as long as wide; sides subparallel on anterior two-thirds, moderately rounded behind; surface rather weakly shining, reticulate, subglabrous; punctures of moderate size, in closely crowded, slightly irregular rows, only first striae impressed; interspaces not quite flat, with only a few smaller punctures on disk, slightly more numerous on sides; ninth interspace distinctly convex. Declivity with sulci of moderate depth, moderately narrow, suture rather weakly elevated, with a few faint granules; punctures of first and second striae reduced; second interspace (fundus of sulcus) shining, devoid of granules and punctures; lateral elevations rather weak, with a few small granules in third interspace; vestiture of declivity rather scanty, with hairs very fine, moderately short, and suberect.

The male is unknown.

Type locality.—Chalco, Mexico.

Host.—*Pinus leiophylla*.

Type material.—Holotype, U.S.N.M. No. 55981.

The holotype was taken from *Pinus leiophylla* at Chalco, Mexico, by Donald DeLeon, January 27, 1936. No other specimen has been seen.

PITYOPHTHORUS REGULARIS, new species

PLATE 22, FIGURE 33

Female.—Light reddish brown (somewhat immature); 1.37 mm. long, 2.52 times as long as wide, allied to *rhois* Swaine.

Frons brightly shining, convex above, with small, rather close punctures, imperfectly flattened below on an approximate semicircle, with punctures fine around periphery, obsolescent toward center, with only a few very fine, inconspicuous hairs; median carina represented by a small tubercle on epistomal margin. Eye rather small, with moderate facets, nearly half divided by emargination. Antenna (fig. 33) with club 1.20 times as long as wide, 1.55 times as long as funicle, widest through third segment, with septa of first two sutures incomplete, nearly transverse.

Pronotum 1.02 times as long as wide, widest near base, posterior outline nearly straight, distinctly margined, angles rounded; sides weakly arcuate on posterior half, then more strongly, convergently arcuate to the constriction, narrowly rounded in front, with anterior margin extended and distinctly serrate; anterior area with asperities fused to form 5 (including marginal serrations) perfectly regular, concentric lines, with a row of fine, dorsally directed hairs from each; summit high, at about middle, with a wide, transverse impression behind it; posterior area with surface shining, distinctly reticulate; punctures moderate in size, depth, and spacing; median line broad, impunctate, not elevated; vestiture very scanty, consisting of very fine, short hairs.

Elytra as wide as pronotum, 1.49 times as long as wide, 1.48 times as long as pronotum; sides subparallel on anterior two-thirds, moderately rounded behind; surface brightly shining, stria rows regular, with punctures deep, close, and moderately coarse, only first stria impressed; interspaces flat, somewhat rugulose, impunctate anteriorly, with a few punctures on posterior third of disk and sides. Declivity moderately steep; suture elevated, with very fine granules; first stria strongly impressed, with punctures reduced, second stria feebly impressed, lateral elevations scarcely higher than suture; all of interspaces punctured and with numerous rather short, erect, yellowish hairs.

Male.—Similar to female but slightly stouter and with apex of elytra more broadly rounded; frons convex, transversely impressed below; punctures sparser, deeper, more uniformly distributed; median carina faint.

Type locality.—Cayamas, Cuba.

Host.—Unknown.

Type material.—Holotype, allotype, and 40 paratypes, U.S.N.M. No. 56012.

The type series was taken by E. A. Schwarz at Cayamas, Cuba, during January and February.

PITYOPHTHORUS SAMBUCL, new species

PLATE 23, FIGURE 38

Reddish brown to piceous-brown, brightly shining: 1.43–1.65 mm. long, holotype 1.6 mm. long, 2.7 times as long as wide; allied to *Pityophthorus rhois* Swaine of Group II.

Frons broadly, transversely impressed below in both sexes, shining, deeply, somewhat roughly, moderately finely and closely punctured below, more sparsely and roughly so above; median carina indicated by a small tubercle on epistoma; hairs short, fine, inconspicuous. Eye with moderate facets, about one-third divided by a rather wide emargination. Antenna (fig. 38) with club about 1.33 times as long as wide, widest through second segment, first two sutures partly septate, transverse.

Pronotum about 1.09 times as long as wide; posterior angles rounded, sides weakly arcuate on posterior two-thirds, definitely constricted just behind broadly rounded, serrate front margin; anterior area with asperities fused at bases to form 4 (including front margin) continuous, concentric ridges; summit slightly anterior to middle, distinctly impressed behind it; posterior area with deep, moderately large, rather sparse punctures (coarser and sparser than in *rhois*), smaller on sides, with a nearly impunctate area; median line rather wide, impunctate, very feebly elevated.

Elytra very slightly wider than pronotum and 1.56 times as long, widest slightly before middle, about 1.64 times as long as wide, sides nearly straight (very feebly arcuate) and subparallel on anterior three-fourths, very broadly rounded behind; surface piceous-brown, brightly shining; punctures deep, moderately large and close, in definite strial rows, only first striae impressed; interspaces rugulose, often more strongly near base, impunctate on anterior two-thirds of disk. Declivity rather abrupt, suture wider and more elevated than on disk, more strongly near apex, without granules and nearly devoid of punctures and hairs; first and second striae with strong punctures; second interspace depressed, forming fundus of sulcus at each side, lateral convexity higher than suture, with numerous punctures, a few small, obsolescent granules and with rather long, erect hairs.

There is little difference between the sexes of this species. Some specimens, supposedly females, are slightly larger and slenderer.

Small differences in sculpture evident in the series are believed to be individual variations.

Type locality.—Jalisco, Mexico.

Host.—*Sambucus* sp.

Type material.—Holotype and 175 paratypes, U. S. N. M. No. 55982.

The holotype and 19 paratypes were taken at the plant quarantine station, port of New York, from *Sambucus* sp. used in crates in several shipments from the state of Jalisco, Mexico. More than 150 additional paratypes taken from unidentified crate wood in nine other interceptions are also at hand.

PITYOPHTHORUS PUDICUS, new species

Male.—Reddish brown, shining; 1.35 mm. long, 2.63 times as long as wide.

Frons convex above, strongly punctured, with median line elevated, impunctate, plainly reticulate; transversely impressed below, with punctures smaller toward epistoma, with fine, short, inconspicuous hairs; median carina fine, sharply elevated. Eye of moderate size, with fine facets; about one-third divided by emargination. Antennal club with all sutures arcuate, first and second partly septate.

Pronotum 1.09 times as long as wide, widest behind; posterior outline nearly straight, strongly margined, posterior angles weakly rounded; sides evenly arcuate from base to anterior lateral constriction, rather narrowly rounded in front, with anterior margin bearing six small serrations, the middle pair being longer; dorsal contour nearly evenly arched, with summit and transverse impression both very poorly developed; anterior area with small, rather wide asperities, more or less united at their bases to form incomplete, somewhat irregular, concentric rows, hairs short, fine and inconspicuous; posterior area with surface moderately shining, finely reticulate, with rather coarse, deep, moderately close punctures on disk, smaller on sides; median line rather wide, slightly elevated, impunctate; disk and sides with minute, scarcely visible hairs.

Elytra slightly wider than pronotum, 1.55 times as long as wide, 1.53 times as long as pronotum; sides subparallel on anterior two-thirds, moderately rounded behind; surface brightly shining, finely indistinctly reticulate; punctures small, moderately deep, in nearly entirely regular rows, only first striae weakly impressed; interspaces flat, finely rugulose, impunctate on anterior two-thirds of disk, sides similar; anterior disk and sides appearing glabrous, but with minute hairs from striae punctures. Declivity moderately abrupt, not sulcate, first striae weakly impressed; interspaces, including suture, not granulate, finely punctured and bearing very fine, rather short, yellowish hairs.

The female is unknown.

Type locality.—Guadalajara, Jalisco, Mexico.

Host.—*Sambucus* sp.

Type material.—Holotype, U.S.N.M. No. 55983.

The holotype was intercepted at the port of New York in a shipment from Guadalajara, Jalisco, Mexico, in the wood of *Sambucus* sp.

PITYOPHTHORUS ALNI, new species

PLATE 23, FIGURES 39, 40

Female.—Black, subopaque to feebly shining; 1.83–2.47 mm. long; holotype 2.47 mm. long, 2.85 times as long as wide.

Frons convex, somewhat flattened below, very wide between eyes, frontal rectangle about 0.50 as long as wide; surface rather weakly shining, finely, roughly punctured, subgranulate above and at sides, punctures nearly lacking on median third just above epistoma; with a rather variable median carina; vestiture consisting of cinereous hairs, short and fine at sides and above, longer and coarser in area at sides and above median impunctate area. Eye small, with moderate facets, more than half divided by a rather wide emargination. Antenna (fig. 39) testaceous, club large, about 1.5 times as long as funicle, widest through third segment, first two sutures feebly arcuate-septate, third more strongly arcuate and devoid of septum.

Pronotum about 1.19 times as long as wide, widest behind; posterior border margined, feebly arcuate; sides nearly evenly arcuate from base to moderately broadly rounded front margin, the constriction scarcely indicated; contour of disk as seen from side nearly evenly convex, without distinct transverse impression behind summit; anterior margin scarcely serrate; disk subopaque to moderately shining; summit slightly behind middle, surrounded by dense, slightly irregular, concentric lines of low, wide asperities, which at sides gradually become lower, but extend backward nearly to posterior margin; disk behind summit deeply, rather roughly punctured; median line punctured across base, but impunctate on a narrow, scarcely elevated area from near base to summit; vestiture rather short and fine on asperate surface, posterior disk nearly glabrous.

Elytra slightly wider than pronotum, about 1.81 times as long as wide, slightly widest behind middle, sides subparallel on anterior two-thirds, narrowly rounded behind; surface black, feebly to moderately shining; striae distinctly impressed, deeply, closely, rather finely punctured; interspaces wider than striae, convex, impunctate or nearly so on anterior half of disk, finely, sparsely punctured behind, with a few short, fine, cinereous hairs. Declivity sloping, not sulcate, with suture slightly elevated; first striae strongly, the others more weakly impressed, strial punctures much smaller than on disk and sides, inter-

spaces weakly convex, with fine uniseriate punctures and moderately numerous, conspicuous, cinereous hairs, stouter and longer than those on disk.

Male.—Very similar to female, but with frons less flattened, transversely impressed below, with median carina somewhat stronger, hairs shorter and less numerous.

Type locality.—Jalapa, Veracruz, Mexico.

Host.—*Alnus* sp.

Type material.—Holotype, allotype, and six paratypes, U.S.N.M. No. 55984.

Holotype, allotype, and 6 paratypes collected from *Alnus* sp., at Jalapa, Veracruz, Mexico, by Donald DeLeon, February 9, 1936.

PITYOPHTHORUS SUBOPACUS, new species

PLATE 23, FIGURES 41, 42

Female.—Dark reddish brown, 1.8–2.2 mm. long; holotype 2.11 mm. long, about 2.93 times as long as wide.

Frons convex, slightly flattened on a semicircular area outlined by an indented margin, surface subshining, reticulate, somewhat rugose, with fine, rather sparse punctures and very fine, sparse hairs of moderate length; median carina usually poorly developed. Eye moderately finely faceted, half divided by wide, deep emargination. Antennal club (fig. 41) rather narrow, 1.3 times as long as funicle, more than one-third longer than wide, widest through second segment; first two sutures nearly straight and partly septate, third suture strongly arcuate, not septate.

Pronotum nearly 1.2 times as long as wide, widest slightly behind middle, posterior angles strongly rounded, sides distinctly arcuate from base to lateral constriction, broadly rounded in front; anterior margin with rather strong, sharp serrations; anterior area with irregular concentric rows of rather sharp asperities; summit rather high, slightly in front of middle, with a distinct transverse impression behind it; posterior area subopaque to weakly shining, with deep, moderately sparse punctures of moderate size, interstices reticulate; median line moderately wide, impunctate, not elevated; disk with short, nearly invisible hairs.

Elytra wider than pronotum, about 1.82 times as long as wide; sides nearly straight and subparallel on anterior three-fourths, moderately rounded behind; surface feebly shining or subopaque, finely reticulate; stria punctures deep, moderately large, in regular stria rows, only first striae impressed; interspaces nearly flat, nearly entirely impunctate except near declivity; vestiture of disk and sides consisting nearly entirely of minute, short, fine hairs from stria punctures. Declivity arched, not sulcate, suture wide, slightly elevated, not granulate;

first striae more strongly impressed than on disk, punctures reduced; second and third striae feebly impressed, punctured as on disk, interspaces, including second, feebly convex, rather sparsely punctured, with fine, erect, moderately long hairs.

Male.—Similar to female in habitus; frons convex above, transversely impressed below, with a strong, rather blunt median carina, punctures sparse and small, with short, fine, inconspicuous hairs; pronotum and elytra similar to those of female.

This species is not very closely allied to any of the species known from Mexico or from the United States. It apparently belongs to group III, although somewhat larger than any other species of that group.

Type locality.—Chalco, Mexico.

Additional localities.—Rio Frio, Puebla; Jalapa, Veracruz, Mexico.

Host.—*Pinus leiophylla*.

Additional hosts.—*Pinus montezumae*, *Pinus cembroides*.

Type material.—Holotype, allotype, and 22 paratypes, U.S.N.M. No. 55985.

The holotype, allotype, and nine paratypes were taken from *Pinus leiophylla* at Chalco, Mexico, January 27, 1936; five paratypes from *P. leiophylla*, at Rio Frio, Puebla, Mexico, February 10, 1936; four paratypes from *Pinus* sp., Rio Frio, February 1936; two paratypes from *Pinus* sp., at Rio Frio, February 10, 1936; and two paratypes from *P. montezumae*, Jalapa, Veracruz, Mexico, February 9. All were collected by Donald DeLeon.

PITYOPHTHORUS CILLATUS. new species

PLATE 23, FIGURES 43, 44

Female.—Piceous, with elytra reddish brown, 1.77–2.06 mm. long; holotype 1.86 mm. long, about 2.70 times as long as wide.

Frons flattened on more than a semicircle extending from eye to eye, margined around outside, finely, densely punctured, with fine, long hairs, those at periphery incurved; median carina faintly indicated below on epistoma. Mandible with fringe of fine hairs rising from near its base and masking basal half. Eye with moderate facets, about half divided by a deep emargination. Antenna (fig. 43) with club 1.27 times as long as wide, much longer than funicle, first 2 sutures nearly straight, partially septate, third suture strongly arcuate, not septate.

Pronotum about 1.11 times as long as wide, widest near base, posterior margin weakly arcuate, posterior angles rounded; sides weakly, arcuately convergent, weakly constricted in front of middle, moderately rounded in front, with anterior margin armed with rather broad, low serrations; anterior area with irregular, concentric rows of rather low

asperities; summit high, slightly in front of middle, with a distinct, broad, transverse impression posterior to it; posterior area rather weakly shining, surface of interstices slightly reticulate, punctures deep, of moderate size, rather sparse; median line wide, impunctate, scarcely elevated; disk subglabrous, sides with a few very fine, short hairs.

Elytra slightly wider than pronotum and about 1.53 times as long, 1.65 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, narrowly rounded behind; surface moderately shining, reticulate, stria punctures moderately small, in nearly regular rows, only first striae impressed; interspaces scarcely rugulose, impunctate on disk except near declivity, sides with a few interstitial punctures, bearing short, fine hairs. Declivity deeply sulcate, suture narrow above, somewhat widened near apex, obsoletely subgranulate, only feebly elevated; punctures of first and second striae obsolete; lateral elevations moderately high, higher than suture, with a row of small, inconspicuous granules in third interspace; vestiture of fine, erect, moderately numerous hairs on third to ninth interspaces.

Male.—Similar to female in size and proportions; frons convex, strongly, roughly punctured, with a rather weak median carina which may be nearly obliterated by the rough punctures; mandible without the conspicuous fringe of hairs as in female, but with a very small tuft of hairs near ventral border; elytral declivity much more deeply sulcate, with sulci slightly narrowed by an in-pushing of lateral convexities.

Type locality.—Jalapa, Veracruz, Mexico.

Host.—*Pinus patula*.

Type material.—Holotype, allotype, and nine paratypes, U.S.N.M. No. 55986.

The holotype, allotype, and nine paratypes were collected from *Pinus patula* near Jalapa, Mexico, by Donald DeLeon, February 9, 1936.

PITYOPHTHORUS RUDIS, new species

PLATE 23, FIGURE 46

Female.—Dark reddish brown, 2.46–2.74 mm. long; holotype 2.60 mm. long, 2.71 times as long as wide; resembling *crassus* Blackman in appearance, but more slender, more regularly punctured on elytra and with notably longer declivital setae.

Frons flattened on a semicircular area extending from eye to eye, margined at periphery, surface moderately shining, with moderately spaced, deep, rather fine punctures, hairs fine, rather long, those at periphery longer and incurved. Mandible with basal fringe of setae in two groups. Eye with moderate facets, half divided by a wide, deep emargination. Antenna (fig. 46) broadly oval, equally wide

through second and third segments; first suture nearly straight, second distinctly arcuate, each with strong but incomplete septum.

Pronotum about 1.05 times as long as wide, widest at base, posterior margin nearly straight, posterior angles rounded; sides feebly convergent and arcuate from base to constriction slightly anterior to middle, moderately rounded in front; anterior margin with 8 to 10 serrations; anterior area with numerous irregularly arranged asperities; summit prominent, slightly in front of middle, with a broad, rather deep, transverse impression posterior to it; posterior area somewhat shining, finely, moderately closely punctured, interstices finely reticulate; median line moderately wide, impunctate, scarcely elevated; disk with short, inconspicuous hairs, those on sides larger.

Elytra slightly wider than pronotum and 1.9 times as long, about 1.82 times as long as wide; sides straight and subparallel on anterior three-fourths, then narrowed to the subtruncate posterior margin; surface moderately shining; stria punctures rather coarse, deep, close, in nearly regular rows, only first striae impressed; interspaces very finely reticulate, nearly impunctate; disk nearly devoid of hairs except for very minute ones from stria punctures. Declivity much less abrupt than in *crassus*, deeply, moderately broadly sulcate, brightly shining; suture narrow, slightly elevated, with fine granules becoming obsolete near apex; punctures of first and second striae obsolete; lateral convexities high (neither so abrupt nor so high as in *crassus*), with a rather close series of moderate-sized granules in the third interspace (smaller and more numerous than in *crassus*); convexities and sides of declivity with numerous, strong punctures bearing long, fine hairs (much longer than in *crassus*).

Male.—Similar to female, but slightly stouter; frons slightly flattened below, with strongly elevated median carina, highest well above epistoma; pronotum as broad as long, with anterior serrations coarser than in female; elytra with punctures appearing somewhat confused, due to numerous similar-sized punctures on interspaces; lateral convexities of declivity higher and more abrupt than in female, with sulcus deeper and narrower.

Type locality.—Amecameca, D. F., Mexico.

Host.—*Pinus* sp.

Additional host.—*Abies religiosa*.

Type material.—Holotype, allotype, and seven paratypes, U. S. N. M. No. 55987.

Holotype and two paratypes collected from unidentified 3-needle pine and allotype and four paratypes from *Abies religiosa*, at Amecameca, D. F., Mexico, by Donald DeLeon.

PITYOPHTHORUS AUCTOR, new species

Female.—Dark reddish brown, 2.14–2.40 mm. long; holotype 2.40 mm. long, 2.61 times as long as wide; allied to *caelator* Blackman, but slightly stouter.

Frons shining, flattened on a semicircle extending from eye to eye, margined at the sides, very finely, moderately closely punctured at sides and above, with very fine, moderately long hairs, median area below shining, impunctate or nearly so, with a broad, rather low median carina. Eye rather short, with moderate facets, half divided by a wide, deep emargination. Antenna with club nearly one-half longer than funicle, very broad oval, widest through third segment, first suture weakly arcuate, second and third progressively more strongly arcuate; first suture strongly septate, second weakly septate, third not septate.

Pronotum about 1.03 times as long as wide, widest at base, posterior margin weakly arcuate, angles scarcely rounded; sides weakly, arcuately convergent from base to constriction, moderately rounded in front, the anterior margin with eight rather low serrations (lower than in *caelator*); anterior area with moderate asperities, in irregular, concentric rows; summit rather high, with a distinct, broad, transverse impression posterior to it; posterior area feebly shining to subopaque, surface reticulate, with moderately coarse, deep punctures; median line rather wide, smooth, impunctate; vestiture of fine, short, inconspicuous hairs on disk, those on sides slightly larger.

Elytra slightly wider than pronotum and 1.66 times as long, 1.64 times as long as wide; sides straight and subparallel on anterior two-thirds, moderately rounded behind (not so broadly as in *caelator*); surface feebly shining, reticulate, subglabrous, strial punctures moderate (slightly larger than in *caelator*), in nearly regular rows, only first striae impressed; interspaces slightly rugose, punctures nearly lacking except near declivity and near base. Declivity moderately sloping; sulci shallow, of moderate width; suture moderately elevated, with fine granules; punctures of first and second striae obsolescent; lateral elevations rather low, no higher than suture, with a row of small, distinct granules in third interspace; vestiture sparse and inconspicuous; entire declivity not so brightly shining as in *caelator*.

Male.—Similar in size and proportions; frons strongly transversely impressed below, with a strongly elevated median carina, extended to form a toothlike structure above epistomal margin; pronotal and elytral structure similar to that of female.

Type locality.—Near Perote, Veracruz, Mexico.

Additional locality.—Limon, Puebla, Mexico.

Host.—*Pinus teocote*.

Additional host.—*Pinus cembroides*.

Type material.—Holotype, allotype, and three paratypes, U.S.N.M. No. 55988.

The holotype, allotype, and three paratypes taken from *Pinus teocote* near Perote, Veracruz, by Donald DeLeon, February 9, 1936; two paratypes taken from *P. cembroides*, February 9, 1936, at Limon, Puebla, by DeLeon.

PITYOPHTHORUS HIDALGOENSIS, new species

PLATE 23, FIGURE 45

Female.—Piceous-brown, with posterior part of elytra reddish brown, 1.57–1.85 mm. long; holotype 1.80 mm. long, about 2.74 times as long as wide; allied to *hubbardi* Blackman, but stouter and usually smaller.

Frons flattened on a nearly circular area with impressed margin, extending from eye to eye, with central half feebly concave, finely and closely punctured, with numerous rather fine, yellowish hairs of moderate length, those at periphery longer and incurved. Eye moderately finely faceted, less than half divided by a rather narrow, angular emargination. Antenna (fig. 45) testaceous, with club oval, first and second sutures weakly arcuate, partially septate, third suture strongly arcuate, without septum.

Pronotum about 1.05 times as long as wide, widest near base, posterior margin nearly straight, posterior angles somewhat rounded, sides nearly straight (very feebly arcuate) and subparallel on posterior half, slightly constricted before middle, moderately broadly rounded in front; anterior margin with numerous rather broad, low serrations; anterior area with rather low asperities in irregular concentric rows; summit moderately high, at center of disk, distinctly, broadly impressed behind it; posterior area with small, rather deep punctures; median line not elevated, rather wide (wider than in *hubbardi*); surface usually moderately shining.

Elytra slightly wider than pronotum, about 1.69 as long as wide; sides subparallel on anterior two-thirds, rather narrowly rounded behind; surface moderately shining, indistinctly reticulate; striae punctures rather close, of moderate size, in regular rows, only first striae impressed; interspaces nearly impunctate anteriorly on disk, subglabrous. Declivity rather sloping, brightly shining, suture normal, not granulate; sulcus rather shallow and narrow, punctures of first and second striae much reduced, obsolescent; lateral elevations not strong, with several obsolescent granules on third interspace; hairs scanty and rather short.

Male.—Similar to female in general habitus; frons transversely impressed above epistoma, transversely elevated (subcarinate) above, with faint median carina below, finely punctured, more sparsely than

in female and with hairs short, fine, and inconspicuous; declivity with nearly obsolete granules as in female.

This species is very closely allied to *hubbardi*, and specimens readily run to that species in the key to Group VI but do not quite agree in several essential characters.

Type locality.—Jacala, Hidalgo, Mexico.

Host.—*Pinus lawsoni*.

Type material.—Holotype, allotype, and eight paratypes, U.S.N.M. No. 55989.

The holotype, allotype, and eight paratypes were collected from *Pinus lawsoni* at Jacala, Hidalgo, Mexico, by Donald DeLeon, January 18, 1936.

PITYOPHTHORUS CRIBRATUS, new species

Female.—Reddish brown, 2.0–2.57 mm. long; holotype 2.14 mm. long, 2.76 times as long as wide; with elytra deeply, closely, confusedly punctured.

Frons convex above, flattened below on less than a semicircle, not definitely margined; surface shining, finely, closely, rather roughly punctured, with moderately short, fine hairs. Eye rather short, moderately finely faceted, about one-third divided by a rather broad emargination. Antenna with club moderately broad oval, widest through second segment; septa of first two sutures subtransverse; third suture not septate, strongly arcuate, subparallel to and very near distal outline.

Pronotum 1.15 times as long as wide, widest near base; sides weakly, arcuately converging from base to constriction anterior to middle, front margin broadly rounded, armed with numerous low, broad serrations; anterior area with rather sparse, broad, low asperities, in incomplete, irregularly concentric rows; summit behind center, of moderate height, impressed at each side behind it; posterior area deeply, closely, coarsely punctured; median line rather narrow, impunctate, strongly elevated anteriorly; hairs short and inconspicuous on disk, slightly longer on sides, much longer and coarser at each side just behind lateral constrictions.

Elytra scarcely wider than pronotum and about 1.57 times as long, 1.72 times as long as wide, sides subparallel on anterior four-fifths, then strongly narrowed to the slightly elevated suture; surface brightly shining, punctures rather coarse and close, very deep, confused, with little indication of stria rows on disk, all of punctures bearing fine, rather short hairs; sides with stria rows irregular, with vestiture as on disk. Declivity rather sloping, broadly, rather shallowly sulcate at each side of the elevated suture, lateral convexity not strongly elevated, slightly lower than suture, both suture and convexity with a few small, obsolescent granules; entire declivity includ-

ing sulci shining, confusedly, cribrately punctured as on disk; hairs distinctly longer than on disk.

Male.—Similar to female but somewhat stouter; frons with an arcuate, transverse carina above, impressed below at each side of a median elevation, more coarsely and less closely punctured than in female and with shorter hairs.

Type locality.—Mexico, D. F.

Host.—Unknown.

Type material.—Holotype, allotype, and seven paratypes, U.S.N.M. No. 55990.

The holotype, allotype, and seven paratypes were taken from the bark of "crate wood" (species unknown) at the plant quarantine station at Nogales, Ariz., in two truck shipments originating at Mexico, D. F., April 3 and April 29, 1941.

PITYOPHTHORUS CUSPIDATUS, new species

Female.—Dark reddish brown, 1.7–2.2 mm. long; holotype 2.19 mm. long, 3.06 times as long as wide.

Frons flattened on a nearly circular area extending nearly from eye to eye, feebly concave in middle, with an indented margin at periphery, very finely and densely punctured, with fine hairs, long and incurved at outside, shorter and very fine elsewhere. Eye with moderate facets, nearly half divided by a deep, wide emargination. Antennal club rather broad oval, much longer than funicle, all three sutures arcuate, first two partly septate.

Pronotum considerably longer than wide, widest near base, posterior margin weakly arcuate, posterior angles scarcely rounded, sides nearly straight and subparallel on slightly more than posterior half, then feebly constricted, very broadly rounded in front; anterior margin with broad, low serrations; anterior area with nearly regular concentric rows of moderate asperities; summit moderately elevated, with posterior transverse impression rather weak; posterior area weakly shining, punctures moderate in size and spacing, interstices reticulate; median line moderately wide, scarcely elevated; hairs scanty and minute on disk, slightly larger but still small at sides.

Elytra scarcely wider than pronotum, about 1.98 times as long as wide; sides straight and subparallel on anterior two-thirds, then gradually narrowed, strongly acuminate at the suture; surface moderately shining, stria punctures deep, of moderate size, in nearly regular stria rows, first striae moderately impressed, others scarcely at all impressed; interspaces narrow, very feebly or not at all convex; scarcely rugulose, nearly impunctate on disk. Declivity rather deeply sulcate; suture narrow, wider behind, moderately strongly elevated, with moderately small but distinct granules; punctures of first and second striae

obsolete; lateral convexities higher than suture, very feebly granulate on third interspace; suture and lateral elevations with erect hairs of moderate length.

Male.—Slightly smaller and stouter than female (1.74 mm. long, about 2.88 times as long as wide); frons convex, transversely impressed below, transversely carinate above; elytra less acuminate behind, punctures somewhat coarser, striae rows less regular; with granules of lateral convexities of declivity slightly coarser and hairs more conspicuous.

Type locality.—Jacala, Hidalgo, Mexico.

Host.—*Pinus* sp., probably *lawsoni*.

Type material.—Holotype, allotype, and 12 paratypes, U.S.N.M. No. 55991.

The type material was taken from *Pinus* sp., tentatively identified as *P. lawsoni*, by Donald DeLeon, at Jacala, Hidalgo, Mexico, January 18, 1936.

The species is most closely allied with *Pityophthorus cacuminatus* Blandford among known Central American forms but differs especially in the different structure of the elytral declivity. Among American forms described from north of Mexico it is fairly close to *P. acutus* Blackman and *P. solers* Blackman, but is readily recognized as different from both of these.

PITYOPHTHORUS PEROTEL, new species

Female.—Reddish brown, 1.51–2.08 mm. long; holotype 1.84 mm. long, 2.77 times as long as wide; allied to *amoenus* Blandford but with declivital sulcus much shallower.

Frons flattened on more than a semicircle, occupying about four-fifths of diameter between eyes, with a slightly impressed margin, closely and finely punctured, with very fine, moderately long hairs, those at periphery slightly longer and incurved. Eye finely faceted, deeply and broadly emarginate. Antennal club broad oval, first two sutures weakly arcuate, partly septate, third suture strongly arcuate, not septate.

Pronotum about 1.12 times as long as wide, widest at base, posterior margin weakly arcuate, posterior angles rounded, sides feebly, arcuately convergent behind, scarcely constricted in front of middle, broadly rounded in front; anterior margin with numerous broad, low serrations; anterior area with numerous broad, low asperities in irregularly concentric rows; summit moderately elevated, with a weak, broad, transverse impression; posterior area moderately shining, with numerous rather small, rough punctures, many with minute granules, interstices somewhat reticulate; median line rather narrow, impunctate, not elevated; disk subglabrous.

Elytra slightly wider than pronotum, about 1.72 times as long as wide; sides nearly straight and subparallel on anterior three-fourths, then narrowed to the acuminate point, produced at sutural angles; surface feebly to moderately shining; stria punctures small, moderately shallow, in nearly regular stria rows, only first striae distinctly impressed; interspaces of moderate width, flat, distinctly rugulose, nearly impunctate except near declivity; disk nearly glabrous, sides with a few small hairs. Declivity with rather shallow sulci each side of the elevated, finely granulate suture; punctures of first and second striae obsolete; second interspace shining, impunctate; lateral convexities no higher than suture, with a few obsolescent granules in third interspace, hairs fine, erect, rather short.

Male.—No unmistakable male of this species was seen, but several specimens that may possibly be males have the frontal vestiture shorter and the declivital vestiture considerably longer than in the female *perotei*.

Type locality.—Perote, Veracruz, Mexico.

Host.—*Pinus teocote*.

Type material.—Holotype and 14 paratypes, U.S.N.M. No. 55992.

The type material was collected from *Pinus teocote* at Perote, Veracruz, New Mexico, by Donald DeLeon, February 9, 1936.

PITYOPHTHORUS SPADIX, new species

Female.—Dark reddish brown, 2.4–3.1 mm. long; holotype 2.80 mm. long, about 3.06 times as long as wide; allied to *confertus* Swaine.

Frons flattened on a nearly circular area extending about three-fourths of distance between eyes, with an indented peripheral margin; finely and densely punctured, with numerous moderately long, fine hairs, those at periphery longer and incurved. Eye moderately faceted, about half divided by a deep, rather wide emargination. Antennal club oval, much longer than funicle, widest through second segment; first two sutures weakly arcuate, partially septate, third suture strongly arcuate, with septum entirely lacking.

Pronotum about 1.12 times as long as wide, widest at posterior angles; posterior margin weakly arcuate, posterior angles rounded; sides nearly straight and feebly converging on posterior two-thirds, very feebly constricted in front of middle, very broadly rounded in front; anterior margin armed with 8 to 10 broad, low serrations; anterior area with irregular, concentric rows of broad, low asperities; summit moderate, with a distinct broad, transverse impression posterior to it; posterior area with deep, rather close, moderately coarse punctures, interstices reticulate; median line not wide, scarcely elevated behind, strongly elevated across transverse impression; disk weakly shining, appearing glabrous, sides with small, inconspicuous hairs.

Elytra wider than pronotum and 1.76 times as long, about 1.98 times as long as wide; sides nearly straight and subparallel on anterior three-fourths, then narrowed to the very strongly acuminate apex, with sutural angles produced; surface moderately shining, faintly alutaceous; strial punctures deep, coarse, and close, in nearly regular strial rows, first striae distinctly impressed, others not at all or very faintly impressed; interspaces rather narrow, with only a few punctures except near declivity; disk nearly glabrous, except in sutural interspaces; sides with a few small hairs. Declivity very deeply, rather broadly sulcate, with sulcus subopaque, suture moderately wide, strongly elevated, more strongly so behind, distinctly granulate and with rather long setae; punctures of first and second striae obsolete; lateral elevations rather strongly elevated, with a continuous row of strong granules in third interspace, forming summit of elevation at each side; finely punctured and with numerous small granules on lateral interspaces; with numerous rather long erect setae.

Male.—Slightly stouter (about 3.01 times as long as wide) and more coarsely and roughly punctured; frons transversely impressed below, with an elevated, arcuate, transverse carina above, more coarsely and roughly punctured than in female, with smaller inconspicuous hairs; elytral disk notably more coarsely punctured, with interspaces narrower and strial rows less regular; declivity with sulci deeper and both suture and lateral elevations slightly higher and with coarser granules.

Type locality.—Rio Frio, Puebla, Mexico.

Host.—*Pinus leiophylla*.

Type material.—Holotype, allotype, and five paratypes, U.S.N.M. No. 55993.

The type series was collected from *Pinus leiophylla*, near Rio Frio, Puebla, February 10, 1936, by Donald DeLeon.

PITYOPHTHORUS CORONARIUS, new species

Female.—Reddish brown, 1.5–1.88 mm. long; holotype 1.79 mm. long, 2.95 times as long as wide, with ends of elytra acuminate.

Frons flattened on more than a semicircle, extending nearly from eye to eye, with an indented peripheral margin; very finely and densely punctured, with very fine hairs of moderate length covering most of surface, and with a margin of coarser, longer, incurved hairs at sides and above. Eye with moderate facets, about one-fourth divided by a broad, shallow emargination. Antennal club rather broadly oval, much longer than funicle, first 2 sutures partly septate, weakly arcuate, third suture strongly arcuate, not septate.

Pronotum about 1.15 times as long as wide, widest near base, posterior margin weakly arcuate, posterior angles scarcely rounded, sides

nearly straight and subparallel on posterior half, then slightly narrowed, very feebly constricted in front of middle, very broadly rounded in front, with margin armed with 8 to 10 low, rather broad serrations; summit rather low, surface not strongly impressed behind it; anterior area with broad, low asperities, in rather irregular concentric rows; posterior area rather feebly shining, punctures small, not deep, with interstices reticulate; median line rather narrow, indefinite, not elevated, often slightly impressed.

Elytra slightly wider than pronotum and 1.68 times as long, 1.83 times as long as wide; sides straight and subparallel on anterior three-fourths, then arcuately narrowed to suture, which is extended to form an acumination; surface moderately shining; stria punctures of moderate size, not deep, in nearly regular rows, only the first stria row impressed; interspaces narrow, surface reticulate, rugulose, impunctate except near base and declivity, subglabrous except at sides. Declivity with suture slightly widened, distinctly elevated, with a few small, distinct granules and a few short, erect hairs; first and second striae with punctures obsolete, with intervening second interspace forming a rather narrow, moderately deep sulcus at each side, impunctate and feebly shining; lateral convexity slightly higher than suture, with a row of small granules in third interspace and a few lateral to third interspace; all declivity except sulci with moderately numerous, fine, erect, moderately long hairs.

Male.—Stouter than female, about 2.7 times as long as wide; frons convex above, transversely flattened below, surface shining, moderately finely and closely punctured; sculpture of pronotum and elytra slightly coarser than in female.

Type locality.—Jalisco, Mexico.

Host.—*Sambucus* sp.

Type material.—Holotype, allotype, and 65 paratypes, U.S.N.M. No. 55994.

The holotype, allotype, and 65 paratypes were taken at quarantine from the bark of *Sambucus* sp. and from bark of unknown crate wood, in shipments from Mexico.

PITYOPHTHORUS DIMIDIATUS, new species

Female.—Reddish brown, very small; holotype 1.22 mm. long, about 2.82 times as long as wide, elytra acuminate at apex.

Frons flattened on an approximate circle, occupying about three-fourths of distance between eyes, without an indented margin, very finely and densely punctured and densely clothed with very fine, moderately short hairs, not longer at periphery; with a distinct carinal tubercle in median line of epistoma. Eye finely faceted, less than half divided by a V-shaped emargination. Antennal club moderately broad

oval, much longer than funicle, first 2 sutures partly septate, nearly straight, third suture arcuate, not septate.

Pronotum about 1.17 times as long as wide, widest near base, posterior margin weakly arcuate, posterior angles rounded, sides nearly straight and subparallel, on posterior two-thirds, slightly constricted in front of middle, broadly rounded in front, with anterior margin armed with numerous small, sharp serrations; summit moderate, weakly impressed behind; anterior area with asperities fused to form 4 perfectly regular, concentric rows; posterior area subopaque, densely reticulate, with very fine, very shallow, sparse, rather indistinct punctures, median line not elevated, moderately narrow; disk apparently glabrous.

Elytra slightly wider than pronotum and 1.65 times as long, about 1.68 times as long as wide; sides subparallel on anterior two-thirds, then narrowed and extended into an acuminate apex; surface weakly shining; strial punctures not deep, close, fine, in nearly regular rows, only first row impressed; interspaces rather narrow, not convex, finely rugulose, impunctate on disk; appearing glabrous. Declivity somewhat sloping, suture elevated and widened posteriorly, with a few minute granules and fine, rather short, erect hairs; punctures of first striae obsolete, those of second obsolescent, second interspace forming a rather deep sulcus each side of suture, subshining, reticulate, impunctate; lateral elevations high, with a row of very small granules along their summits in third interspaces; sides of declivity finely punctured, with rather fine, short, erect hairs.

Male.—Slightly stouter, widest through pronotum, the sides of which are arcuate; frons transversely flattened below, arcuately elevated above, with punctures not so fine and close as in female, with a few short hairs; declivity with granules and hairs better developed than in female.

Type locality.—Mexico (taken at quarantine).

Host.—Unknown.

Type material.—Holotype, allotype, and one paratype, U.S.N.M. No. 55995.

PITYOPHTHORUS ATTENUATUS, new species

Female.—Reddish brown; holotype 1.62 mm. long, 3.23 times as long as wide, with elytra acuminate and pronotal asperities fused to form regular concentric ridges.

Frons flattened on an approximate semicircle, occupying three-fourths of distance between eyes, feebly concave at center, very finely and closely punctured, with fine hairs of moderate, nearly uniform length. Eye with moderate facets, one-third divided by a rather wide V-shaped emargination. Antennal club rather broad oval, considerably longer than funicle, sutures arcuate.

Pronotum about 1.2 times as long as wide, widest near base, posterior margin slightly arcuate, posterior angles rounded, sides nearly straight and subparallel on posterior two-thirds, weakly constricted in front of middle, broadly rounded in front, with margin armed with numerous serrations; summit elevated, distinctly, transversely impressed behind; anterior area with asperities fused to form four perfectly regular, concentric ridges (including front margin); posterior area shining, punctures small, shallow, moderately sparse, interstices reticulate; median line not elevated, moderately narrow; hairs scanty and small, minute on disk.

Elytra scarcely wider than pronotum and 1.75 times as long, 2.06 times as long as wide; widest through anterior third, sides nearly straight, subparallel on anterior three-fourths, acuminate behind, with sutures slightly extended; surface moderately shining, strial punctures deep, moderately fine, in regular strial rows, only first striae impressed; interspaces narrow, not convex, impunctate on disk except for a very few punctures near base and declivity; subglabrous. Declivity moderately, rather shallowly sulcate; suture rather narrow, strongly elevated; with small, distinct granules, and with a few fine, moderately short hairs; punctures of first and second striae entirely obsolete; sulcus at each side, impunctate, shining; lateral convexities little higher than suture, distinctly granulate in third interspace, finely, moderately closely punctured, with fine, moderately short hairs.

Male.—Not quite so slender as female, about 3.16 times as long as wide; frons broadly impressed below, with median tubercle on epistoma, transversely carinate above, surface shining, finely punctured, less closely than in female; elytral declivity with sulci slightly deeper.

Type locality.—Mexico.

Host.—Unknown.

Type material.—Holotype, allotype, and 48 paratypes, U.S.N.M. No. 55996.

Intercepted at quarantine from unidentified crate wood.

PITYOPHTHORUS COSTALIMAL, new species

PLATE 22, FIGURE 34

Female.—Reddish brown; 1.96 mm. long, 2.79 times as long as wide; allied to *fortis* Blackman and *virilis* Blackman but with declivital sulcus strongly punctured.

Frons flattened on more than a semicircle extending from eye to eye, brightly shining, moderately finely and closely punctured, with fine hairs from most of area, with longer, coarser, incurved, golden-yellow hairs from periphery. Eye of moderate size, rather coarsely faceted, nearly half divided by a V-shaped emargination. Antenna (fig. 34) with club 1.28 times as long as wide, 1.43 times as long as funicle; first

two sutures weakly arcuate, strongly, not completely septate; third suture more strongly arcuate, indicated by row of setae nearly parallel to distal outline.

Pronotum 1.24 times as long as wide, widest behind middle, posterior outline weakly arcuate, posterior angles rounded; sides nearly evenly arcuate from base to anterior, lateral constriction, very broadly rounded in front, anterior margin with broad serrations; anterior area with broad, rather low asperities in irregular concentric arrangement, with rather long, fine hairs; summit low, transverse impression very indistinct; posterior area shining, punctures rather fine, moderately spaced; median line impunctate, very feebly elevated; disk subglabrous; anterior area with hairs longer than usual.

Elytra as wide as pronotum and 1.29 times as long, 1.63 times as long as wide; sides subparallel on anterior three-fourths, then broadly rounded but with the suture slightly extended to form a subacuminate apex; surface shining, with coarse, deep, confused punctures, only first stria row impressed; punctures on sides less confused than on disk; hair scanty on anterior disk and sides. Declivity originating considerably behind middle, steep; suture elevated, rather narrow at summit but widened toward apex, with a few granules on posterior third; with a distinct sulcus at each side, involving first and second striae and intervening second interspace, strongly, deeply confusedly punctured; lateral elevations strong, higher than suture above, with several moderate granules; sides strongly punctured; with conspicuous, erect, rather numerous hairs.

Male.—Similar to female in habitus; frons shining, broadly transversely impressed below, convex above, with a rather weak, arcuate, transverse carina, punctures coarser, deeper, and not so close as in female, with a few moderate hairs; pronotal asperities slightly coarser than in female; elytral declivity with sulci deeper, lateral elevations higher, and bearing larger granules.

Type locality.—Brazil.

Host.—Undetermined wood.

Type material.—Holotype, allotype, and two paratypes, U.S.N.M. No. 56013.

The type series, consisting of three females and one male, were taken at quarantine, April 22, 1936, in a shipment from Brazil in the bark of undetermined wood.

PITYOPHTHORUS SHANNONI, new species

PLATE 22, FIGURE 86

Female.—Light reddish brown (probably somewhat immature); 1.73 mm. long, 3.10 times as long as wide; with apex of elytra rather weakly acuminate.

Frons very short and wide, less than half as long as wide, convex above, flattened below on less than semicircle, brightly shining, densely, minutely punctured below with very numerous, very fine, yellow hairs of moderate, nearly uniform length. Eye very large, coarsely faceted, nearly half divided by a sharp V-shaped emargination. Antenna (fig. 36) with club 1.25 times as long as wide, 1.35 times as long as funicle; first 2 sutures arcuate, with moderately developed, partial septum, third suture slightly more strongly arcuate, indicated by setae.

Pronotum 1.28 times as long as wide, widest behind, posterior outline weakly arcuate, finely, distinctly margined, posterior angles scarcely rounded; sides straight and subparallel on more than posterior half, feebly constricted in front of middle, very broadly rounded in front, with anterior margin bearing very wide, rather low serrations; anterior area with very broad, low asperities, arranged in nearly regular, concentric rows (but not fused at bases), hairs numerous and moderately short; summit moderate, slightly in front of middle, with transverse impression posterior to it shallow; posterior area subopaque, distinctly reticulate, finely, shallowly, not closely punctured; median line very narrow, slightly elevated; disk glabrous; sides slightly more shining, with a few hairs near lateral margin.

Elytra as wide as pronotum, 1.85 times as long as wide, 1.44 times as long as pronotum; sides nearly straight and feebly converging on anterior two-thirds, then more strongly, arcuately narrowed, and extended into a short acumination; surface moderately shining, finely, indistinctly reticulate; punctures deep, moderately coarse, close, in nearly regular rows, only first stria impressed; interspaces narrow, flat, with only a few punctures of same size as those of striae; with very few erect hairs on disk, longer and more numerous on sides. Declivity moderately steeply arched; suture moderately elevated near summit, strongly elevated at apex, with a few punctures and setae but no granules; first and second striae narrow, strongly impressed, punctures obsolescent, with intervening second interspace forming fundus of sulcus; lateral elevations much higher than suture, punctate, with 3 large granules in third interspace and a few much smaller granules lateral to it; all except second interspace with rather numerous yellow, erect setae.

Male.—Very similar to female in habitus; frons flattened below as in female, but with punctures much coarser and much less dense, with sparse, short hairs; declivital sulci with coarser punctures and lateral elevations higher.

Type locality.—Cano Saddle, Gatun Lake, Panama.

Host.—Unknown.

Type material.—Holotype, allotype, and one paratype, U.S.N.M. No. 56015.

The type series was collected by R. C. Shannon at Cano Saddle, Gatun Lake, Panama, May 3, 1923.

PITYOPHTHORUS ZETEKI, new species

PLATE 22, FIGURE 35

Female.—Reddish brown; 1.71 mm. long, 2.93 times as long as wide; with elytral apex acuminate and declivital interspaces setose.

Frons flattened from eye to eye on more than a semicircle, feebly shining, punctures very fine, moderately close, with fine, long, yellow hairs, longer and curved inward at periphery. Eye rather large, coarsely faceted, about one-third divided by emargination. Antenna (fig. 35) with club 1.24 times as long as wide, 1.44 times as long as funicle; first 2 sutures scarcely arcuate, with septa strong but incomplete; third suture strongly arcuate, indicated by row of setae.

Pronotum 1.23 times as long as wide, widest on posterior half, posterior outline weakly arcuate, margined, posterior angles rounded; sides straight and subparallel on posterior half, feebly narrowed at weak lateral constrictions, very broadly rounded in front, with anterior margin finely serrate; anterior area with small, low, weak asperities, in irregularly concentric arrangement, with rather short, fine hairs, inconspicuous except in profile; summit low, with posterior transverse impression broad and shallow; median line unmodified, with punctures as on rest of disk; sides shining; disk and sides apparently glabrous.

Elytra as wide as pronotum, 1.76 times as long as wide, 1.44 times as long as pronotum, sides nearly straight and subparallel for more than three-fourths of length, then strongly narrowed, with sutural region drawn out into a sharp acumination; surface brightly shining, with rather coarse, deep, very close punctures forming regular, impressed striae, first stria more deeply impressed; interspaces rather narrow, devoid of setae except near declivity; sides with punctures smaller, striae not entirely regular and not impressed except on posterior third. Declivity rather steeply arched; suture elevated throughout, strongly extended at apex, finely punctured and with moderately small granules; first stria strongly impressed, all striae strongly punctured, all interspaces punctured and all but second more or less granulate, with first and alternate interspaces more strongly granulate; lateral elevations not so high as suture; all interspaces bearing moderately short, stout, erect, yellowish setae.

Male.—Slightly shorter and stouter than female, 2.77 times as long as wide; frons convex, transversely impressed below, moderately coarsely punctured, with hairs sparse, short, and fine; elytral declivity more strongly sculptured, with much coarser granules, especially on third interspace; declivital hairs coarser than in female.

Type locality.—Trinidad River, Panama.

Additional locality.—Alhajuelo, Panama.

Host.—Unknown.

Type material.—Holotype, allotype, and four paratypes, U.S.N.M., No. 56014.

The type, allotype, and two paratypes were taken at Trinidad River, Panama, May 2 and 4, 1911, and June 9, 1912; one paratype was taken at Alhajuelo, Panama, April 5, 1911. All were collected by A. Busck.

Genus GNATHOTRICHUS Eichhoff

GNATHOTRICHUS DELEONI, new species

Male.—Light reddish brown; 3.23 mm. long, 3.32 times as long as wide; allied to *sulcatus* (LeConte) and *aciculatus* Blackman.

Frons convex above, somewhat flattened below, convergently aciculate, with very evident punctures among aciculations; slightly indefinitely elevated in median line below. Eye broad oval, moderately coarsely faceted, broadly, moderately emarginate on inner margin. Antenna lighter in color, with club 1.7 times as long as funicle, 1.28 times as long as wide, slightly widest through third segment, first and second sutures septate, strongly arcuate. Pregula normal.

Pronotum 1.2 times as long as wide; sides subparallel, feebly arcuate, broadly rounded in front, with front margin slightly extended, with broad, low serrations; anterior area dark reddish brown, with somewhat irregular, subconcentric rows of broad, low asperities; summit anterior to middle, scarcely elevated, with surface posterior to it scarcely flattened; posterior area yellowish brown, opaque, finely reticulate, with extremely minute, very indistinct punctures, glabrous; beaded marginal line imperfectly developed, or apparently absent. Anterior tibia with only two submarginal, socketed teeth.

Elytra scarcely wider than pronotum, twice as long as wide; sides subparallel, very feebly narrowed posteriorly, very narrowly rounded behind with posterior margins slightly extended; surface subopaque, finely reticulate, minutely rugulose; punctures very minute and very indistinct, not in entirely regular striae rows; disk and sides glabrous. Declivity sloping, not truly sulcate, but feebly, indefinitely impressed each side of suture, lateral elevations almost entirely lacking, with a few very faint indications of minute, obsolete granules; vestiture scanty, consisting of very fine, rather short hairs.

No female of this species has been seen.

Type locality.—Chalco, D. F., Mexico.

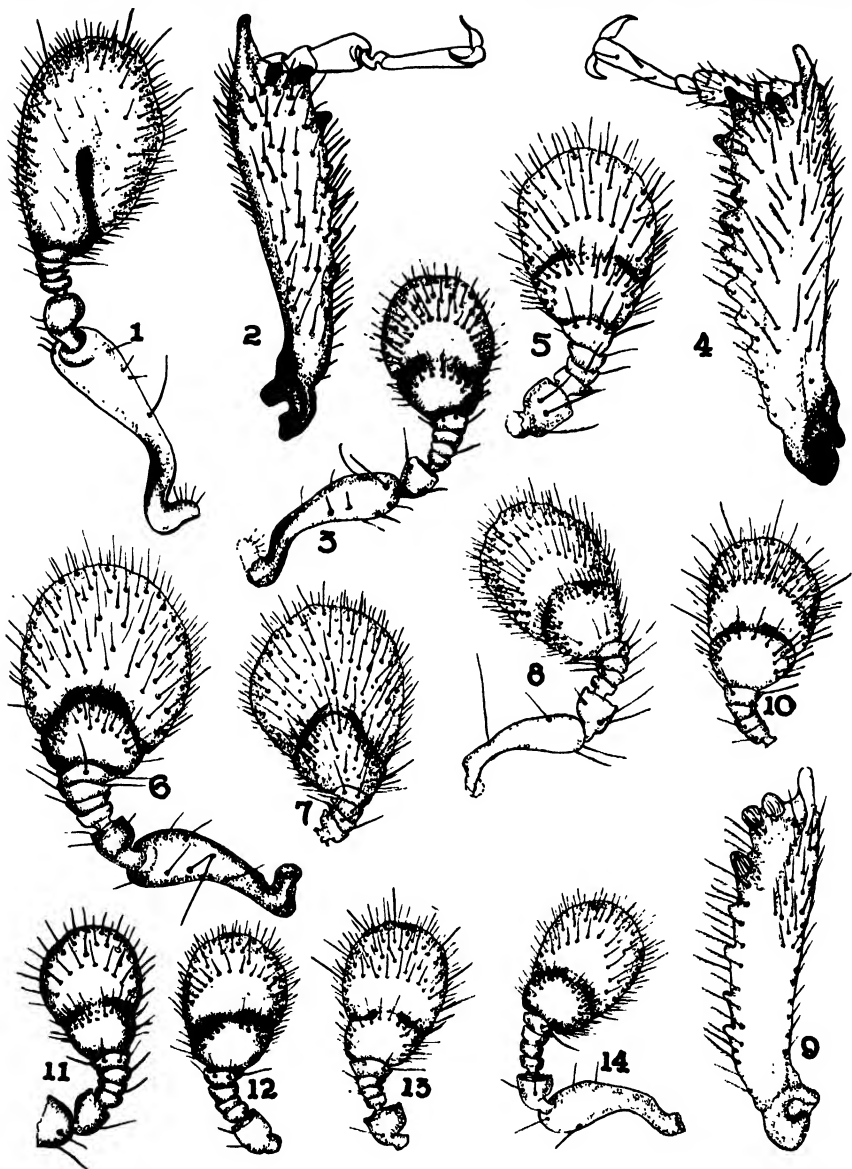
Host.—*Pinus leiophylla*.

Type material.—Holotype and three paratypes, U.S.N.M., No. 55997.

The holotype and three paratypes were taken from Chihuahua pine (*P. leiophylla*) at Chalco, D. F., Mexico, by Donald DeLeon, in whose honor the species is named.

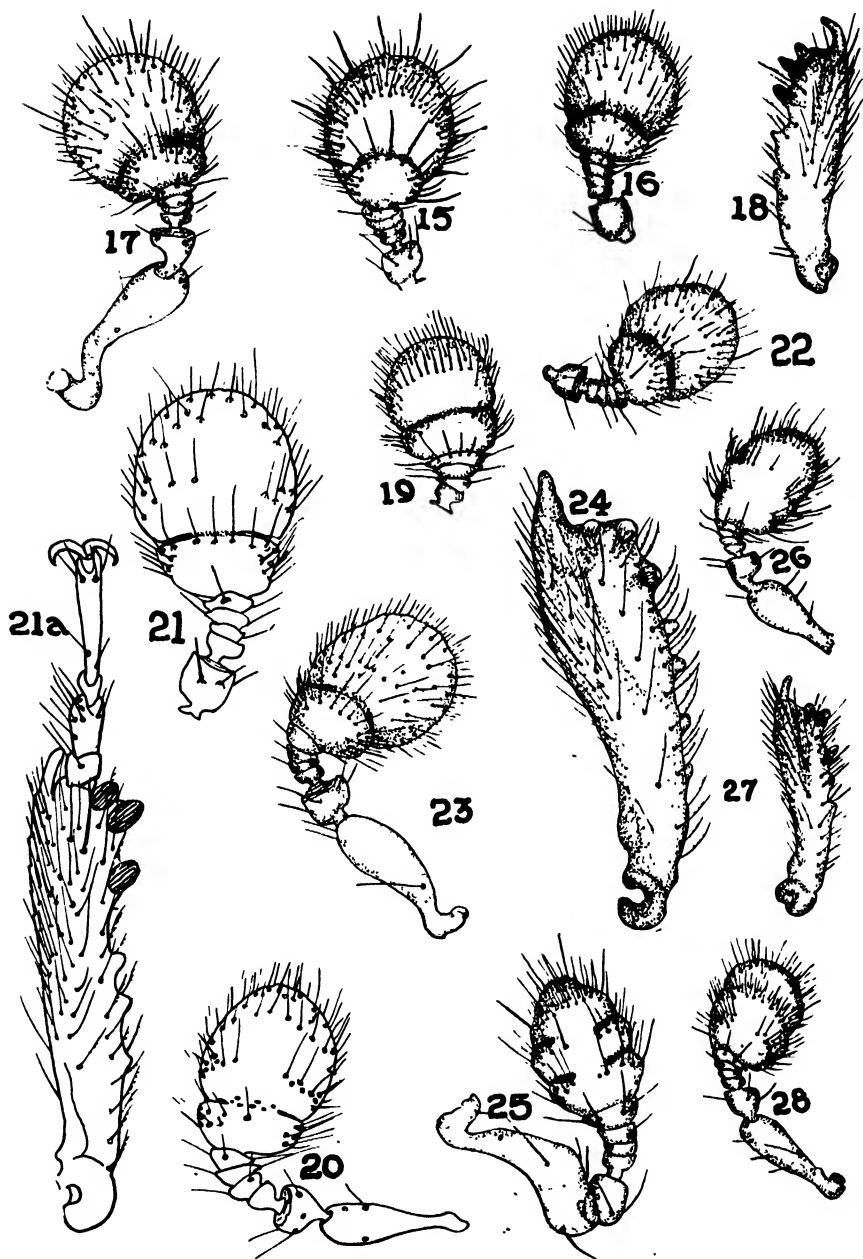
NOTE

All the drawings for the plates that follow were made from camera-lucida outlines by Mrs. Claudelle L. Gaddis under the author's direction.



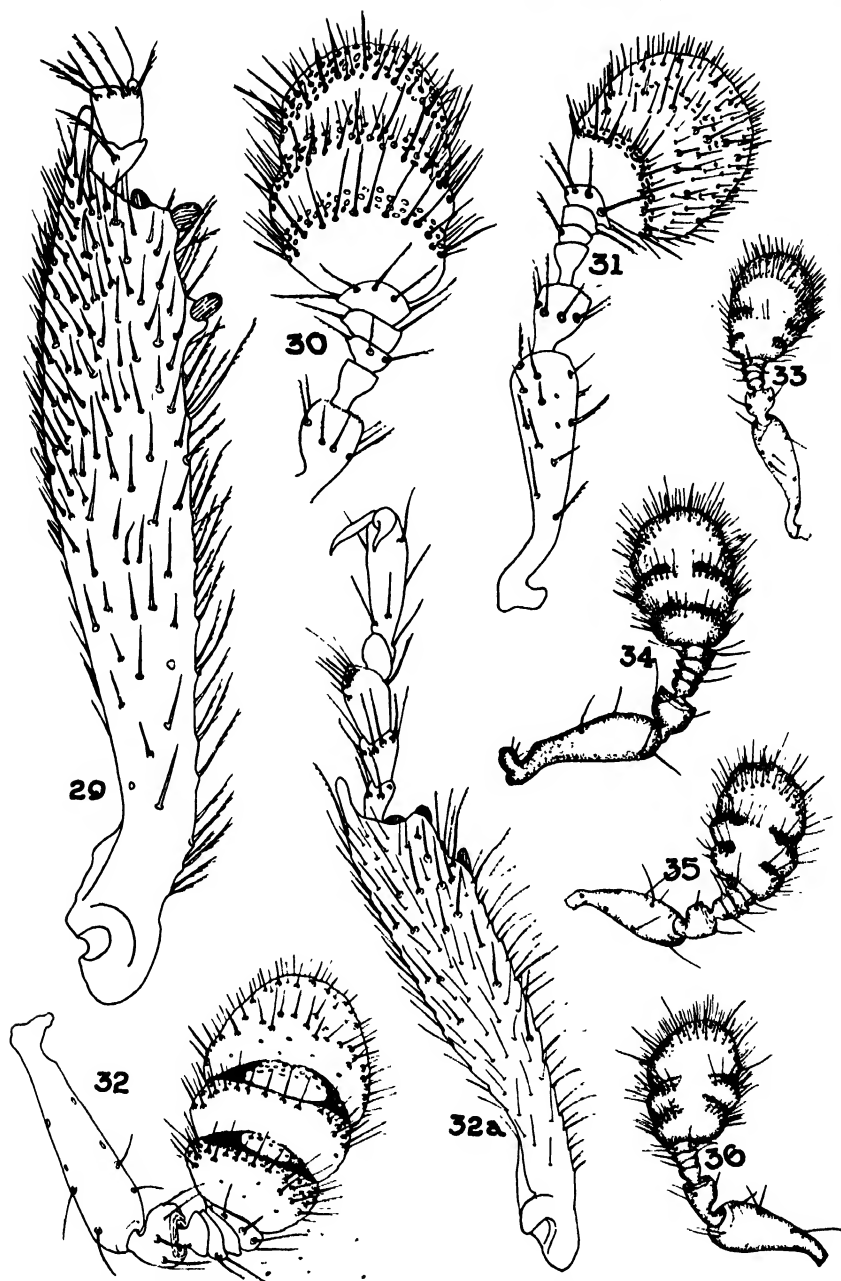
SPECIES OF THAMNOPHTHORUS AND NEODRYOCOETES

- 1, *Thamnophthorus schwarzi*, antenna; 2, *T. schwarzi*, fore tibia and tarsus; 3, *Neodryocoetes hubbardi*, antenna; 4, *N. hubbardi*, fore tibia and tarsus; 5, *N. mucunae*, antenna; 6, *N. columbianus* Schedl, antenna; 7, *N. tabogae*, antenna; 8, *N. cubensis*, antenna; 9, *N. cubensis*, fore tibia; 10, *N. hostilis*, antenna; 11, *N. caribaeus*, antenna; 12, *N. guianae*, antenna; 13, *N. humilis*, antenna; 14, *N. hoodi*, antenna.



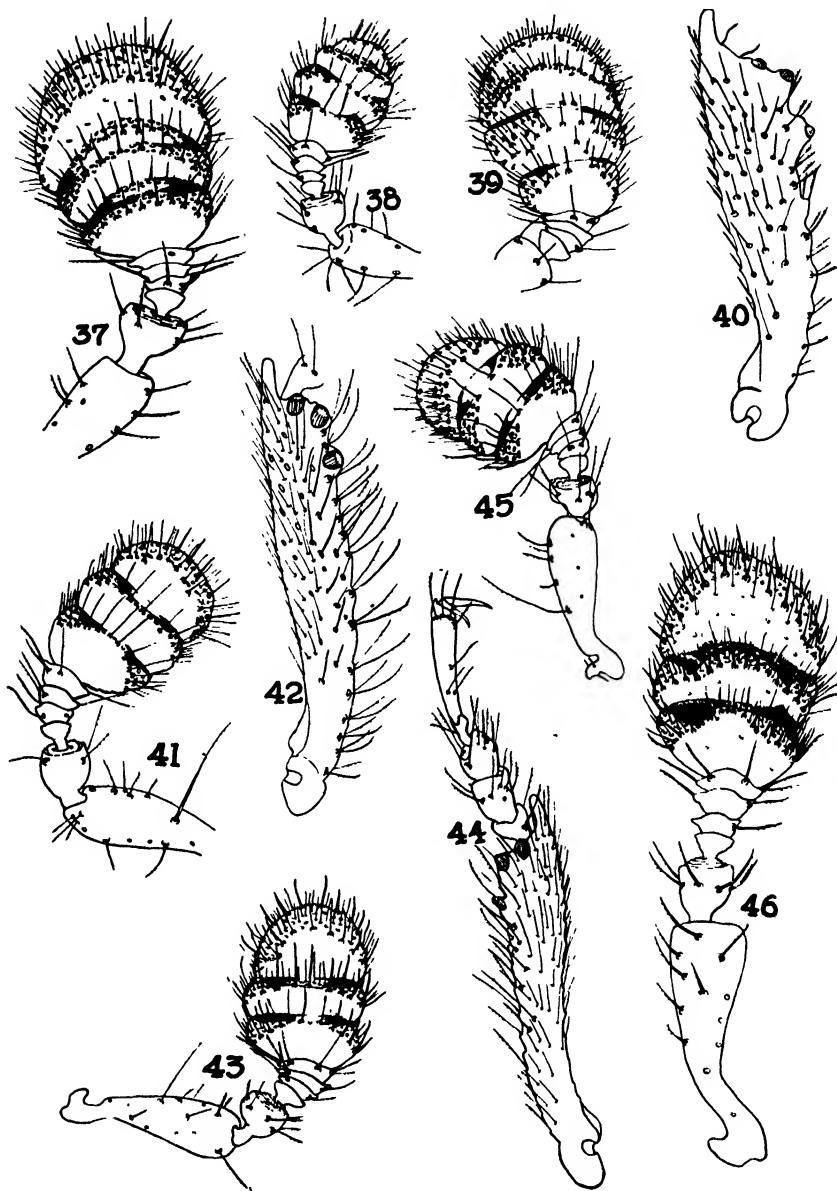
SPECIES OF NEODRYOCOETES, SPERMOPHTHORUS, AND PITYOPHTHOROIDES

- 15, *Neodryocoetes buscki*, antenna; 16, *N. teres*, antenna; 17, *N. pallidus*, antenna; 18, *N. lenis*, fore tibia; 19, *N. insularis* (Eggers), antenna; 20, *N. schedli*, antenna; 21, *N. exquisitus*, antenna; 21a, *N. exquisitus*, fore tibia; 22, *N. lenis*, antenna; 23, *N. tenuis*, antenna; 24, *Spermophthorus caesalpiniae*, fore tibia; 25, *S. caesalpiniae*, antenna; 26, *Pityophthoroides pudens*, antenna; 27, *P. pudens*, fore tibia; 28, *P. robai*, antenna.



SPECIES OF MYELOBORUS, PITYOBORUS, AND PITYOPHTHORUS

- 29, *Myeloborus deleoni*, fore tibia; 30, *M. deleoni*, antenna of male; 31, *M. deleoni*, antenna of female; 32, *Pityoborus tertius*, antenna; 32a, *P. tertius*, fore tibia; 33, *Pityophthorus regularis*, antenna; 34, *P. costalimai*, antenna; 35, *P. zeteki*, antenna; 36, *P. shannoni*, antenna.



SPECIES OF PITYOPHTHORUS

- 37, *Pityophthorus leiophyllae*, antenna; 38, *P. sambuci*, antenna; 39, *P. alni*, antenna; 40, *P. alni*, fore tibia; 41, *P. subopacus*, antenna; 42, *P. subopacus*, fore tibia; 43, *P. ciliatus*, antenna; 44, *P. ciliatus*, fore tibia; 45, *P. hidalgoensis*, antenna; 46, *P. rudis*, antenna.

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OSTEOLOGY OF POLYGLYPHANODON, AN UPPER
CRETACEOUS LIZARD FROM UTAH

By CHARLES W. GILMORE

ONE of the important discoveries made by the 1937 Smithsonian paleontological expedition to central Utah was the finding of eight individuals of an undescribed member of the Sauria. In 1938 a field party under Dr. C. L. Gazin revisited the locality and recovered the remains of four more individuals, one of which is the most complete skeleton yet found. These specimens, four of which were partially articulated, so fully supplement one another that, except for the distal end of the tail, practically all other parts of the skeletal structure are now known. Although among the most ancient Sauria from North America, they have the distinction of being more completely preserved than any specimens of the suborder yet discovered on this continent. These specimens display a type of dentition not before known in the Sauria, either living or extinct.

Associated with the relatively abundant species is one other smaller species represented by several incomplete jaws.

A preliminary description of these two lizards has already been published,¹ and it is the purpose of the present paper to describe the complete osteology of *Polyglyphanodon*. The smaller forms of this fauna will be considered in a separate article.

The drawings illustrating this paper were made by Sydney Prentice.

¹ Gilmore, C. W., New fossil lizards from the Upper Cretaceous of Utah. Smithsonian Misc. Coll., vol. 99, No. 16, pp. 1-3, 1940.

Order SAURIA

POLYGLYPHANODONTIDAE, new family

For family relationships, see page 264.

Genus POLYGLYPHANODON Gilmore

Polyglyphanodon GILMORE, Smithsonian Misc. Coll., vol. 90, pp. 1-2, 1940.

Etymology: πολὺς, many; γλύφανος, chisel; ὀδούς, tooth.

Genotype.—*Polyglyphanodon sternbergi* Gilmore.

Diagnosis: Dentition subacrodont, heterodont; teeth posterior to the first seven transversely widened, with sharp transverse cutting edges; upper and lower teeth indistinguishable; skull deep, strongly constructed; pineal foramen on parietofrontal suture; premaxillary with long spine; postfrontal distinct; postorbital present, maxillary deep; squamosal wide dorsoventrally; coronoid extending high above level of ramus; splenial extensive but falling short of symphysis; surangular and articular distinct; angular greatly restricted on external surface; vertebrae procoelous; zygosphenes and zyganchtra well developed; centra tapering; 29 presacral, 2 sacral vertebrae; coracoid with one emargination; clavicles perforate; interclavicle anchor-shaped, with bifurcated proximal end; ilium with rectangular upper extremity; ischia and pubes like *Iguana*; limb bones of moderate length, stout; feet typically lacertian; digital formula of manus: 2, 3, 4, 5, 3; digital formula of pes: 2, 3, 4, 5, 4.

POLYGLYPHANODON STERNBERGI Gilmore

Polyglyphanodon sternbergi GILMORE, Smithsonian Misc. Coll., vol. 90, pp. 1-2, fig. 1, 1940.

Type.—U.S.N.M. No. 15477, consists of the skull, lower jaw, and many skeletal parts; collected July 22, 1937.

Paratype.—U.S.N.M. No. 15816, consists of a nearly complete articulated skeleton; collected in July 1938.

Locality.—"South Dragon," Manti National Forest, Emery County, Utah.

Horizon.—Lower part of North Horn formation, Upper Cretaceous.

Specific name.—In honor of George F. Sternberg, who found the first specimen.

Other specimens: In addition to the type specimen there were skeletal parts of 11 other individuals available for this study. All of these came from a small "badland" area in a valley locally known as the "South Dragon," about midway between Ferron Canyon on the south and the road crossing the valley to North Horn Mountain on the north. There has been much faulting in this area, and I was

unable to determine the exact position of the lizard-bearing stratum in the Upper Cretaceous section. That it was in the dinosaur-bearing part of the section was abundantly indicated by the finding of several fragmentary dinosaur specimens both above and below the lizard layer. The locality is referred to at various places in this paper as the "lizard locality." (Pl. 24.)

A detailed list of the parts comprising the several specimens is here given in order that the reader may have a full knowledge of the available materials.²

LIST OF AVAILABLE SPECIMENS

- U.S.N.M. No. 15477, type. Nearly complete skull and lower jaws with full dentition; axis and 3 articulated cervical vertebrae; 15 dorsal, 2 sacral, and 3 caudal vertebrae; complete pelvis; both femora; right tibia, distal end of left tibia; fibula, astragalus, calcaneum; many bones of hind foot and tarsus; humerus, lacking distal end; proximal end of ulna; numerous bones of fore foot; fifth cervical rib, right side; last thoracic rib of right side; many incomplete thoracic ribs. Collected by George B. Pearce, July 22, 1937.
- U.S.N.M. No. 15559: Left maxillary with teeth, articulated parietal and frontal, right quadrate, right ramus complete and part of left ramus, both with teeth, and skull fragments; 15 presacral vertebrae; right scapula and coracoid, part of left scapula; left clavicle; interclavicle; left humerus and distal half of right humerus; both ulnae; both radii; some carpal and fore-foot bones; fragmentary portions of pelvis; femur lacking proximal end; tibia; numerous pieces of ribs. Collected by George B. Pearce, July 22, 1937.
- U.S.N.M. No. 15566: Left quadrate with articulated squamosal; articulated series of 29 vertebrae (6C, 18D, 2S, 2Ca), greater portion of right scapula and coracoid; right clavicle complete and part of left clavicle; interclavicle; complete left humerus and fragments of right; both ulnae; radius; part of carpus and fore foot; nearly complete left half of pelvis and part of right half; both femora; both tibiae; many tarsal and bones of hind feet, most of the ribs of left side articulated, a few parts of ribs. Collected by George B. Pearce, July 22, 1937.
- U.S.N.M. No. 15567: 5 presacral vertebrae, incomplete tibia, and many fragmentary bones. Collected by George B. Pearce, July 22, 1937.
- U.S.N.M. No. 15568: Nearly complete disarticulated skull, both rami, good dentition; axis centrum, 3 cervical vertebrae; 6 dorsal and 22 articulated caudal vertebrae; right scapula and coracoid and portions of left scapula; right clavicle; interclavicle; left humerus; both ulnae; numerous carpal bones; one nearly complete articulated fore foot and numerous elements of the other; articulated pelvis with both hind limbs and feet complete. Collected by George F. Sternberg, July 22, 1937.
- U.S.N.M. No. 15569: Incomplete lower jaws without teeth, tibia, fibula, and a portion of a foot. Collected by George B. Pearce, July 23, 1937.
- U.S.N.M. No. 15573: Portion of a maxillary with teeth, fragmentary parts of both scapulae, parts of both humeri, astragalus, calcaneum, several foot bones, and numerous fragments. All parts weathered out. Collected by George F. Sternberg, July 22, 1937.

² Several additional specimens were collected by the 1940 Smithsonian Paleontological Expedition. To date skeletal parts of nearly 60 individuals have been found.

- U.S.N.M. No. 15816: Nearly complete articulated skeleton, lacking most of the tail, worked out in relief in the matrix. Collected by George F. Sternberg, 1938.
- U.S.N.M. No. 15817: Articulated hinder portion of the skeleton of a very large individual; 7 presacral, 2 sacral, and 22 caudal vertebrae in series; pelvis and both hind limbs and feet complete. Collected by George F. Sternberg, 1938.
- U.S.N.M. No. 15818: Fragmentary dentary; 8 presacral vertebrae; both humeri, left complete; both radii; an ulna; left scapula and coracoid; left clavicle; both ilia; both ischia; one pubis; numerous foot bones. Collected by George F. Sternberg, 1938.
- U.S.N.M. No. 15819: Series of 18 articulated vertebrae (2 sacrals, 9 caudals, 7 presacrals); incomplete ilium; right femur; tibia and a part of tarsus and foot; left fibula, tibia, tarsus, and part of left hind foot; numerous fragmentary vertebrae. Collected by Smithsonian Paleontological Expedition, 1938.

THE SKELETON

In the pages to follow there is given a detailed description of practically the complete skeletal anatomy of *Polyglyphanodon*. Since the manuscript descriptive of the skull and skeleton and most of the pen and ink illustrations were prepared prior to the discovery of the very complete skeleton (U.S.N.M. No. 15816) shown in plate 25, it has been deemed expedient to retain the less perfect individual (U.S.N.M. No. 15477) as the type originally selected and to designate the other as the paratype. This somewhat unusual procedure was decided on, not only for the reasons mentioned above, but because of the desire to retain the better specimen in its articulated state in relief in the original matrix. This treatment of the specimen renders it unavailable for proper detailed illustration, or for complete description of the individual bones.

The paratype, as shown in plate 25, is lying prone on its belly, with the ribs distended and regularly spaced on each side of the line of vertebrae. The articulated limbs and feet are stretched out free of the body. The axial skeleton is practically complete from the tip of the skull to the eighth caudal vertebra. Only the twelfth vertebra from the skull and the tail beyond the eighth caudal vertebra are missing.

That the twelfth vertebra is lacking is indicated by a gap in the series and also by the presence of portions of both ribs that formerly articulated with it. All the elements of both the pectoral and pelvic girdles appear to be present, but some of these have been damaged by crushing and others cannot be exposed in their entirety because of the overlying spinal column.

The more important structural features of the skeleton displayed only by this specimen are: The complete presacral formula of 29 vertebrae; complete perforate clavicle; complete interclavicle; and complete digital formula of the manus. The skull is in more perfect preservation than the type and has furnished important supplemental information that has been incorporated not only in the descriptive matter but in the illustrations as well.



Views of the locality where the type and other specimens of *Polyglyphanodon sternbergi* Gilmore were found: *A*, Badland area of the North Horn formation (the man in the right center is standing at the spot where the type was collected); *B*, distant view of the lizard locality, the denuded area in the central part of the picture; Ferron Canyon is shown at the extreme right. Both photographs by C. L. Gazin.

SKULL

The description of the skull is based primarily on the almost complete articulated cranium and lower jaws of the type specimen, U. S. N. M. No. 15477. It is supplemented by skull portions of three other specimens: U.S.N.M. No. 15816, the paratype; No. 15568, the greater portion of a disarticulated skull; and No. 15559, consisting of the articulated parietal and frontal and a left maxillary. The type has suffered some deformation through crushing, which has obscured structural details of the supratemporal and postorbital arches. Except for this, the right side of the skull is in good preservation, though the left side is slightly less well preserved.

Viewed laterally, the skull of *Polyglyphanodon* is subtriangular in outline, with heavy arches and a deep maxillary region. Except for the dentition the skull is normal lacertilian in all respects. The principal structural features of the skull are clearly illustrated in figures 16-19, drawn from the type, with some details added from the evidence furnished by other specimens.

Parietal.—The parietal (*p*) is relatively short, with flattened dorsal surface, and is transversely constricted posteriorly to its midlength. On each posterior external angle long, slender, divergent processes form much of the inner and posterior boundaries of the supratemporal fossae. Between these processes the posterior border is broadly hollowed out. Both of the posterior processes are missing in the type, but the right is preserved in its entirety in specimen U.S.N.M. No. 15568, and both are present in U.S.N.M. No. 15816. Anteriorly this bone joins the frontals by a straight, transverse digitating suture. This border at the center is deeply notched by the pineal foramen. Camp³ observes: "The foramen is usually pierced between the parietals but, in the *Iguania* and *Rhaptoglossa*, where these bones are constricted posteriorly it sometimes migrates forward to lie in the frontoparietal suture."

The plane of the parietal is at a distinct angle to that of the frontal region, being depressed posteriorly. This angulation begins at the frontoparietal suture. On the anteroexternal angle the parietal articulates with the postfrontal, which sends a thin, widened process backward along the side of the parietal, as shown in figure 16. Along the anterior end the dorsal surface is roughened by a few ridges and grooves that extend slightly diagonal to the median axis. At the center the parietal of the type specimen measures 12 mm. in length, with a least transverse diameter of 9.4 mm.

³ Camp, C. L., Classification of the lizards. Bull. Amer. Mus. Nat. Hist., vol. 48, p. 394, 1923.

Frontal.—The frontal (*f*) region of the type is checked and broken, so that much of the description is based on the better-preserved frontals of U.S.N.M. Nos. 15568 and 15816. In these specimens they are distinctly separate along the median line, but in the type specimen they are coossified. Their anterior ends unite with the nasals by a V-shaped suture that indents the ends of the frontals. Laterally the frontal articulates with the prefrontals and postfrontals much as in *Glyptosaurus*. The anterior and posterior processes of the postfrontals and prefrontals do not meet above the orbit but are separated by an interval of 6.5 mm. This space constitutes the frontal contribution to the boundary of the orbit. The lateral border above the

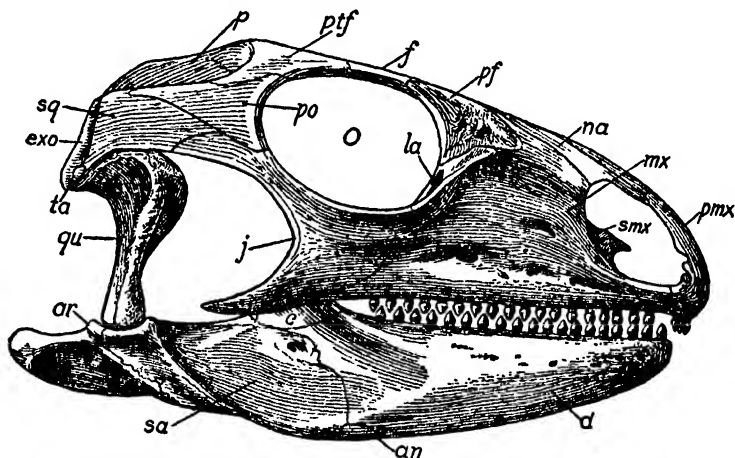


FIGURE 16.—Skull of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size, viewed from the right side: *an*, Angular; *ar*, articular; *c*, coronoid; *d*, dentary; *exo*, exoccipital; *f*, frontal; *j*, jugal; *la*, lachrymal; *mx*, maxillary; *na*, nasal; *o*, orbit; *p*, parietal; *pf*, prefrontal; *pmx*, premaxillary; *po*, postorbital; *ptf*, postfrontal; *qu*, quadrate; *sa*, surangular; *smx*, septomaxillary; *sq*, squamosal; *ta*, tabulare.

orbit is beveled from above downward and inward. On the ventral side, as shown by specimen U.S.N.M. No. 15559, the lower edge of the beveled surface forms a low-curved ridge that extends from one end of the bone to the other. The ridge becomes more prominent toward the anterior end, forming the lateral boundary of the olfactory portion of the brain. Between the orbits the frontals of the type specimen have a least transverse diameter of 10 mm. The dorsal surface is ornamented by a series of alternating transverse ridges and depressions.

Nasals.—The nasals (*na*) are irregularly shaped bones with long, slender anterior extremities that embrace the long posteriorly directed spine of the premaxillary, as shown in figure 17. Laterally the frontal articulates entirely with the maxilla, being excluded from contact with the prefrontal by the interposition of the slender,

superior process of the maxillary. The frontal contribution to the formation of the boundary of the external nares is damaged on both sides of the type skull, and this part of the restored skull has been drawn following U.S.N.M. No. 15816, which has this region completely preserved.

Premaxillary.—The premaxillary (*pmx*) has an unusually long spine that extends far posterior between the nasal bones. Viewed from above the nose is broadly rounded, the alveolar border giving support to six small premaxillary teeth. Laterally the premaxillary united with the maxillary by a straight vertical suture. Near the base of the spine, the border is scalloped by two small notches one above the other (see fig. 16).

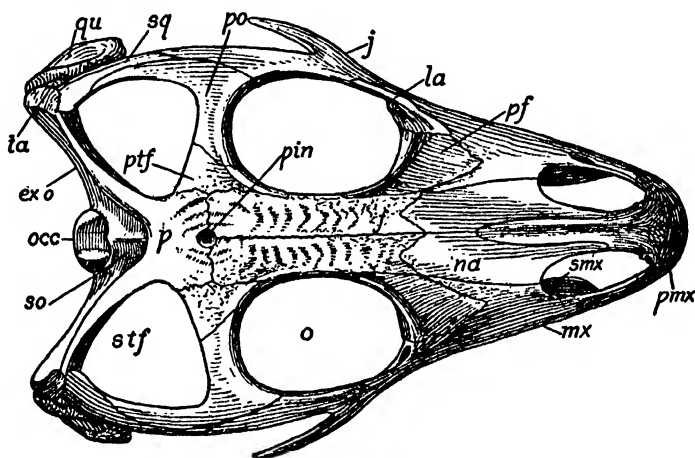


FIGURE 17.—Skull of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size, viewed from the top: *exo*, Exoccipital; *f*, frontal; *j*, jugal; *la*, lachrymal; *mx*, maxillary; *na*, nasal; *o*, orbit; *occ*, occipital condyle; *p*, parietal; *pin*, pineal foramen; *pf*, prefrontal; *pmx*, premaxillary; *po*, postorbital; *ptf*, postfrontal; *qu*, quadrate; *smx*, septomaxillary; *so*, supraoccipital; *sq*, squamosal; *stf*, supratemporal fossa; *ta*, tabulare.

Maxillary.—The maxillary (*mx*) viewed from the side is subtriangular in outline and is unusually deep at the midline. The posterior end underlaps the jugal, its posterior end terminating below the center of the orbit. Above it articulates with the lachrymal, prefrontal, and nasal, interposing a slender pointed process posteriorly between the prefrontal and nasal bones, as in the agamid lizard *Hydrosaurus pustulosus*. This bone carries a full complement of 18 teeth, which occupy an alveolar space 32.6 mm. in length. The anterior end is deeply excavated to form the posterior and ventral boundaries of the anterior nares. The external surface of the bone is smooth except for a number of small foramina, three of which are arranged in a row slightly above, but nearly parallel to, the alveolar border.

Septomaxillary.—In the right nareal opening a small irregular shaped bone (*smx*, fig. 16), in contact with the inner side of the maxillary, is tentatively regarded as being the septomaxillary.

Prefrontal.—The prefrontal (*pf*) is a subtriangular bone whose posterior extremity along the side of the frontal terminates in front of the orbital center. Anteriorly, the bluntly pointed end is wedged in between the upper and lower posterior branches of the maxillary. The prefrontal does not have the usual contact with the nasal bone, being entirely separated from it by the interposition of the slender maxillary process. Ventrally it articulates with the lachrymal.

Postfrontal.—The postfrontal (*ptf*) is a triradiate element that articulates about equally with the parietal and frontal extending across their line of junction (see fig. 17). On the left side of the type skull, the postfrontal displays a squamous sutural border for union with the postorbital which looks downward and forward. On the right side, however, no trace of this sutural junction can be detected, a condition suggesting that in old individuals these two bones might become fully coalesced.

Postorbital.—That there was a distinct postorbital (*po*) bone in *Polyglyphanodon* is clearly indicated in the paratype, U.S.N.M. No. 15816, where the sutures delimiting this element are plain on both sides of the skull. It fills the interspace between the postfrontal and jugal, its anterior edge contributing much to the orbital border, as shown in figure 16. Posteriorly it unites by squamous suture with the squamosal, tapering out to a slender pointed process that lies upon the top border of the squamosal.

In some lizards the postorbital is fused with the postfrontal (*Ardeosaurus*), but according to Siebenrock it is entirely absent in *Crotaphytus* and most Agamidae.

Lachrymal.—The lachrymal (*la*), viewed laterally, is narrow and elongate dorsoventrally and in articulated position is wedged in between the jugal, maxillary, and prefrontal bones. Much of its outer surface forms a prominent diagonal ridge, which is a continuation of the upper jugal border. A large lachrymal foramen perforates the bone, the external opening of which is shown within the anterior rim of the orbit (see fig. 16).

Jugal.—The jugal (*j*) is deep and massive, with a long tapering spur that projects backward and downward from its posterior angle. This spurlike process is missing on the jugal of the type specimen, but the paratype has it completely preserved. Anteriorly this bone joins the lachrymal by a nearly horizontal suture, and it unites with the maxillary by a long, diagonal overlap. Posteriorly, its slender, upwardly directed process underlaps the postorbital and abuts the squamosal, as illustrated in figure 16. The jugal in *Polyglyphanodon*

is more massive, and the spurlike process is more extensively developed than in any lizard with which I have been able to make comparison.

Squamosal.—Both of the squamosal (*sq*) bones in the type skull are more or less damaged, but the paratype has both well preserved. They are relatively short bones, deep dorsoventrally, with a squarely truncate posterior end. This end is in contact with the paraoccipital process of the exoccipital, the posterior process of the parietal and the tabulare, and with them forms the posterior angle of the skull. It abuts the paraoccipital process of the exoccipital. On the lower side near the posterior end it is hollowed out by the cotylus for the articulation of the quadrate. Superiorly it joins the posterior branch

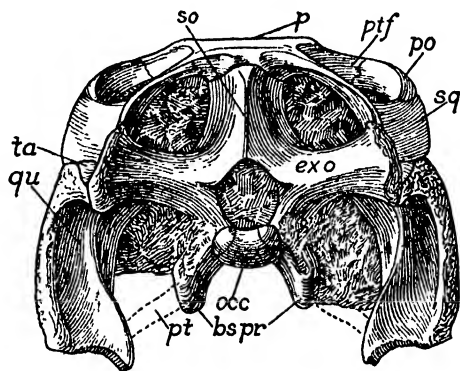


FIGURE 18.—Skull of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size, posterior view: *bspr*, Basipterygoid processes; *exo*, exoccipitals; *occ*, occipital condyle; *p*, parietal; *po*, postorbital; *pt*, pterygoid; *ptf*, postfrontal; *qu*, quadrate; *so*, supraoccipital; *sq*, squamosal; *ta*, tabulare.

of the postorbital by squamous union, thus forming the supratemporal arcade. The full course of the squamosal-postorbital suture, as shown in figure 16, is derived largely from the evidence of the paratype.

Tabulare.—The presence of a tabulare (*ta*) is clearly indicated on the left side of the type specimen, where its posterior end is intercalated between the squamosal, quadrate, and paraoccipital process, as shown in figure 18.

Quadrate.—The right quadrate (*qu*) of the type is in beautiful preservation and in articulated position. Quadrates are also present in specimens U.S.N.M. Nos. 15559, 15556, and 15816. Viewed posteriorly the outer border, which is thickened and roughened, is bowed outward from end to end with a wide external conch. This border projects backward beyond the level of the adjacent surface. The articular proximal end is rounded anteroposteriorly and strongly overhangs the posterior surface. A sharp ridge develops at the base

of the head and continues downward in a diagonal direction to the inner side of the distal end. On the inner side a thin winglike process extends forward and inward from the main mass of the bone. The anterior face of the quadrate presents a shallowly concave front. The distal articular end is concave transversely and strongly convex anteroposteriorly, with a prominent downward projection of the inner border.

Occiput.—The occipital region of the type skull is practically complete, but two wide cracks passing horizontally through the back separate some of the bones, and this fact has necessitated some adjustments in drawing the reconstruction shown in figure 18. The sutures of the occipital region are all coalesced and can no longer be traced. The supraoccipital (*so*) is stout and has a sharp median ridge extending downward from the top to the foramen magnum. The exoccipitals (*exo*) form the lateral boundaries of the foramen. As shown by specimen U.S.N.M. No. 15568, where the exoccipitals are detached from the basioccipital, they participate in the formation of the occipital condyle (*occ*) (see fig. 18). The condyle is reniform and of relatively small size. The paraoccipital processes extend outward and backward, terminating in expanded ends that are in contact with the tabulare (*ta*), squamosal (*sq*), and quadrate (*qu*).

Palate.—The palate of the type skull, U.S.N.M. No. 15477, although distorted by the lateral crushing of the cranium, displays most of its important features. It has been skillfully reconstructed by Mr. Prentice in figure 19 and, while errors of detail may eventually be shown, it is believed the more important structures are correctly interpreted.

The basioccipital and basisphenoid are fully coossified, no trace remaining of their sutural junction. The basioccipital processes (*bspr*) are stout rounded projections that extend downward and slightly outward, with rounded obtuse distal terminations. The basisphenoid (*bsp*) at its anterior external angles develops a pair of strong divergent processes, the dilated extremities of which articulate with longitudinally elongated facets on the medial sides of the pterygoids. The pterygoids (*pt*), widely divergent posteriorly, are in contact with the quadrates. On their inner sides, slightly posterior to their midlength, they are in articulation with the basisphenoid processes. The slender, posterior, barlike portions of the pterygoids have their greatest diameters nearly vertical, and it is assumed they were longitudinally hollowed out, as in *Iguana*. Forward of the contact with the basisphenoid processes the pterygoids widen transversely, their widened anterior ends articulating with the palatines (*pal*). There are no teeth on the pterygoid bones, but at about midlength the palatal surfaces are traversed transversely by a low, sharp ridge that extends across nearly the whole width of the bone. Opposite the ridge the

pterygoids develop robust downwardly projecting processes that articulate by squamous sutures on the external sides with the strongly developed ectopterygoid (*ecpt*) bones, which are interposed between them and the maxillaries (*mæ*) as shown in figure 19.

The sutural contact of pterygoids and palatines is by a diagonal suture that starts at about midlength of the pterygomaxillary vacuity (*ptmæv*) and extends inward and forward toward the median line. The palatines appear to be narrowly separate on the midline, at least posteriorly; anteriorly they may have been in apposition, as in *Iguana*. Anteriorly the palatines are relatively slender and join the vomers by a long diagonal overlapping suture. Posterior to midlength the right palatine develops a thin outwardly directed process that laps along the

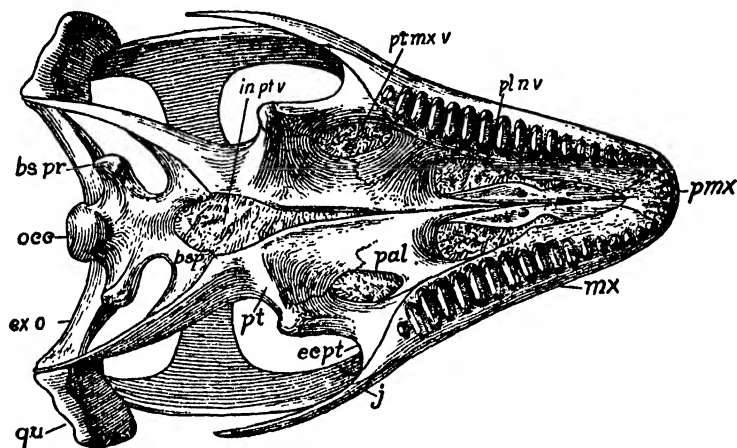


FIGURE 19.—Palate of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size: *bsp*, Basisphenoid; *bspr*, basioccipital process; *ecpt*, ectopterygoid; *exo*, exoccipital; *inptv*, interpterygoid vacuity; *j*, jugal; *mx*, maxillary; *occ*, occipital condyle; *pal*, palatine; *plnv*, palatonarial vacuity; *pmx*, premaxillary; *pt*, pterygoid; *ptmæv*, pterygomaxillary vacuity; *qu*, quadrate; *v*, vomer.

inner side of the maxillary. This process forms the posterior boundary of the palatonarial vacuity.

The vomers (*v*) are distinct but closely applied to one another along the median line. Their forward ends are received in a concave notch on the posterior sides of the premaxillaries. Laterally, forward of the constriction, they also appear to be in contact with the maxillaries, as shown in figure 19. There are five important vacuities in the bony palate. The interpterygoid vacuity (*inptv*) is a single median aperture, bounded laterally by the pterygoids, and probably extending some way between the palatines; posteriorly it is bounded by the hypophyses of the basisphenoid. The pterygomaxillary vacuity in *Polyglyphanodon*, as contrasted with those of *Iguana*, are much reduced in size.

They are bounded outwardly by the maxillary and ectopterygoid, inwardly by the pterygoid and palatine, in front by the palatine, and behind by the pterygoid and ectopterygoid.

The palatonares, also paired vacuities, are long and narrow, bounded externally by the maxillary, internally by the vomer and palatine, posteriorly by the palatine.

In addition to these usual openings, the vomer is perforated near its anterior end by a small foramen, and there appears to be an aperture through the palatine near its posterior end.

The palate of *Polyglyphanodon* in its general design resembles that of the *Iguana*, especially in the robustness of the downwardly projecting pterygoid process, and the stout ectopterygoid and the manner of its attachment to the posterior end of the maxillary. It differs in the much reduced size of the pterygomaxillary vacuities, and the more posterior position of the palatine processes that unite with the maxillary.

Measurements.—Comparative skull measurements (in millimeters) are as follows:

	Type	Paratype
Greatest length over all.....	81.5	80.0
Greatest width across tops of quadrates.....	45.0 ^e	52.0
Greatest width across jugals.....	-----	58.5
Greatest width across center of nares.....	14.0	14.0
Least width of parietal at center.....	9.5	8.5
Least width of frontal at center.....	11.0	12.0
Greatest height of skull with lower jaws.....	60.8	-----
Diameter of orbit anteroposteriorly.....	-----	27.0
Vertical diameter of orbit.....	25 ^e	21.0
Greatest length of quadrate.....	31	-----
Greatest length of squamosal.....	-----	16.0
Greatest length of frontal.....	35 ^e	32.2
Greatest length of parietal.....	-----	19.0
Greatest width of occipital condyle.....	9	-----

^e=estimated

LOWER JAW

The rami of the type specimen are in excellent preservation and in articulated position with the skull, but many of the sutures are indistinct. In all there were seven other rami in the collection, and from a study of all it has been possible to delimit most of the individual elements of the mandible and to determine it as consisting of six distinct bones: dentary, angular, surangular, articular, coronoid, and splenial. It is assumed that the prearticular is present but fused with the articular, as it is in most adult lizards.

The ramus as a whole is strong and massive, deepest at the center and narrowing toward the ends.

Dentary.—The dentary gives support to 19 teeth, and viewed from above, as in figure 21, it has a sinuous dental border, the anterior end curving inward to meet its fellow of the opposite side. On the inner side of the anterior end a rounded, flattened surface indicates the extent of their union at the symphysis (see fig. 20). The dentary-surangular suture lies below the anterior half of the coronoid, much as in *Pelto-saurus*.

Angular.—The angular (*an*) in a lateral view is slightly visible on the mid lower border and again where its posterior extremity turns upward toward the articular. In its limited participation in the lateral surface of the ramus, the angular has its closest approximation in the Agamidae. On the inner side it probably underlies the pre-articular and at the forward end is in contact with the splenial and dentary. On the inner side near the upper anterior end the angular

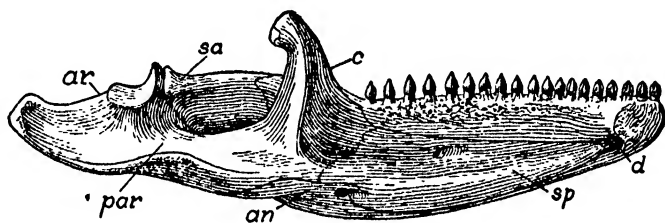


FIGURE 20.—Left ramus of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, internal view, natural size: *an*, Angular; *ar*, articular; *c*, coronoid; *d*, dentary; *par*, pre-articular; *sa*, surangular; *sp*, splenial.

is perforated by a small foremen (see fig. 20). Its long tapering anterior extremity is intercalated between the splenial and dentary.

Surangular.—The surangular (*sa*) is relatively short and deep and comprises practically all the area between the dentary and the articular on the external side of the ramus, as clearly shown in figure 16. Near its posterior end a prominent sharp ridge extends from the anterior border of the cotylus diagonally downward and forward across the whole depth of the bone, much as in *Cyclura*. On the inner side a nearly vertical suture shows its union posteriorly with the articular (see fig. 20). Anteriorly it unites with the coronoid. Its sutural articulation with the prearticular is so fully coalesced that it cannot be traced in any of the materials now available.

Coronoid.—The coronoid (*c*) rises prominently above the general level of the ramus, with a decided backward bend near its upper extremity. On its inner side a sharp median perpendicular ridge extends from almost the top to the bottom of this bone, thus giving it additional strength. The ventral border on the internal side probably meets the anterior end of the prearticular, but the sutures in all

available specimens have been obliterated. Anteriorly it meets the dentary and splenial.

Articular.—The articular (*ar*) forms the entire angle of the jaw. The end posterior to the cotylus is gently incurved and has a bluntly truncated termination. Viewed externally the whole surface from the top downward strongly recedes inward. The upper border immediately posterior to the cotylus is deeply concave. The cotylus is shallowly concave anteroposteriorly, bifossate. It has a greatest width of 7.5 mm. Most of its outer wall is formed by the surangular.

Splenial.—The splenial (*sp*) is a thin triangular shaped bone that laps along the lower inner side of the dentary. Its pointed anterior extremity ends short of the symphysis. Except at the anterior end it completely covers Meckel's groove and in a lateral view is not



FIGURE 21.—Right ramus of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15568, superior view, natural size: *ar*, Articular; *c*, coronoid; *d*, dentary.

visible on the lower border. A foramen perforates its upper median border. The large size and great anteroposterior extent of the splenial in *Polyglyphanodon* shows a striking distinction from the small, limited splenial of *Cyclura* and *Iguana* or the very small splenial found in the Agamidae.

Prearticular.—Although the prearticular is indicated in figure 20, I have been unable to delimit its boundaries.

Measurements.—The measurements of the ramus of the type, U.S.N.M. No. 15477, are as follows (in millimeters):

Greatest length.....	85.5
Greatest depth at posterior end of tooth row.....	16.5
Depth of ramus at anterior end.....	5.5
Depth of ramus to top of coronoid.....	24.3
Transverse width at middle of tooth series.....	5.7

Differences.—The splenial is very small or absent in the Agamidae, and the dentary has the greatest posterior extent in the Chamaeleonidae and Agamidae, either being a feature that would disbar *Polyglyphanodon*. The Meckelian groove is open in Chamaeleonidae, Agamidae, and Varanidae but is roofed over more or less completely in all other families, as it is in *Polyglyphanodon*.

TEETH

The outstanding feature of *Polyglyphanodon sternbergi* is the transverse widening of the teeth of the posterior half of the dental

series, a style of dentition never before observed in the Sauria, either living or extinct (see figs. 19 and 21). These teeth display a sharp transverse cutting edge, with a subtriangular cusp on the outer edge in both upper and lower teeth. There is no indication of median cusps, as in the teeth of *Diadectes* or *Trilophosaurus*, to which these teeth have a resemblance in their great transverse width. This smooth, sharp-edged crown is smoothly beveled on both sides of the cutting edge. The sides of the teeth swell out and then contract sharply to the root. The lower teeth fit between the upper teeth when the jaws are closed, thus closely interlocking.

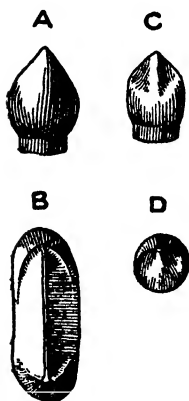


FIGURE 22.—Lower teeth of *Polyglyphanodon sternbergi* Gilmore, U.S. N.M. No. 15568, all five times natural size: A, Fourteenth tooth, enumerated from the front, lateral view; B, same, top view; C, fourth tooth, internal view; D, same, top view.

The anterior teeth in external view are conical, but on the inner side the crowns are slightly excavated dorsoventrally on each side of an incipient median ridge (see C and D, fig. 22). This vertical ridge grows progressively more prominent in a posterior direction. On the eighth lower tooth (fig. 21) and seventh upper tooth, it suddenly extends laterally into a sharp cutting edge on the crown, the whole crown being about one-half the width of the next tooth posteriorly. The succeeding teeth grow progressively wider, reaching the maximum size on the tenth. Those following remain constant in diameter as far as the seventeenth, which is perceptibly narrowed. The last or eighteenth tooth in the maxillary and the last or nineteenth tooth in the dentary are greatly reduced and conical, with faint inner vertical ridge.

The complete dentition of *Polyglyphanodon* as indicated by the type specimen shows the dental formula to be as follows:

$$\frac{\text{maxillary 18, premaxillary 3}}{\text{dentary 19}} = \frac{42}{38}$$

The teeth are heterodont and anchylosed to the jaw bones in shallow pits that are regarded as subacrodont in character of implantation. These shallow depressions for the teeth in no way correspond to the alveoli of the typical thecodont attachment but are more like those of the Amphibia. There is no uniformity of opinion as to what kind of tooth insertion is oldest in the Sauria. The fossil record seems to indicate that thecodonty has preceded both pleurodonty and acrodonty, as pointed out by Camp.⁴ The teeth are solid, and in none of the specimens is there evidence of replacement teeth.

⁴ Camp, C. L., Classification of the lizards. Bull. Amer. Mus. Nat. Hist., vol. 48, p. 364, 1923.

VERTEBRAE

The vertebral column is represented by relatively long articulated series in 4 of the 12 known individuals, besides a considerable number of short series and separate vertebrae belonging to other specimens. From a study of all, most of the column is known except the distal half of the tail.

All the vertebrae are procoelous. The vertebral column is best represented in specimen U.S.N.M. No. 15816 (see pl. 25), which has 39 articulated vertebrae present. Twenty-nine of these are presacral, two sacral, and eight anterior caudals. Beginning with the atlas, 11 are articulated in series. A short gap separates the eleventh and thirteenth, but posterior to this interval they form a continuous series ending with the eighth caudal. That the twelfth vertebra is missing is indicated by the presence in sequential position of parts of both ribs that formerly articulated with it, as shown in plate 25.

In view of the little disturbed condition of the vertebrae with practically all the ribs in articulated position, it would appear that 29 represents the complete presacral series. A skeleton of *Iguana*, in comparison, has 24 presacral vertebrae.

How many of these are to be designated cervical depends entirely on how the count is made. Most authorities regard all vertebrae whose ribs attain a connection with the sternum as belonging to the dorsal series. This criterion, however, is of little practical use with fossil specimens, since the evidence of such a connection is seldom preserved. In the present specimen the spinous processes undergo a distinct change on the ninth vertebra, and this may indicate the point of division between cervical and dorsal. If so, there would be 8 cervicals and 21 dorsals, but the presence of long ribs articulated with the seventh and eighth vertebrae in specimens U.S.N.M. Nos. 15816 and 15566 appears to indicate adequately that these vertebrae were attached to the sternum as in *Iguana* and are therefore dorsal. There are no lumbar, for the last presacral bears a short rib, as shown by three specimens.

The sacrum is composed of two noncoalesced vertebrae, as shown by the type and by U.S.N.M. Nos. 15566 and 15816.

The total number of caudal vertebrae cannot be determined from available specimens. Specimen U.S.N.M. No. 15817 (see plate 25) has a series of 19 vertebrae of the anterior portion of the tail, articulated in series with the sacra, and when these are compared with those of an *Iguana* of the same size they appear to indicate a tail of about equal length and proportions. The restoration in plate 26 has been given 48 vertebrae in the tail, with a total length of about 18 inches.

The vertebral formula of *Polyglyphanodon sternbergi*, as known at this time, may be stated as C-6; D-23; S-2: CD (48±).

Atlas.—The atlas is present only in specimen U.S.N.M. No. 15816, and as it remains in the original articulated position it is not available for detailed study. The neurapophyses are seen to arch over the neural canal, though separate on the median line, and a backward-projecting process carries the posterior zygapophysis for articulation with the axis. All other parts of this bone remain hidden in the matrix.

Axis.—The detailed description of the axis is to a great extent based on that of the type, only the incomplete spine being restored after the axis of U.S.N.M. No. 15816, as shown in figure 23. This element is also present in specimens U.S.N.M. Nos. 15566 and 15568, but both are less well preserved.

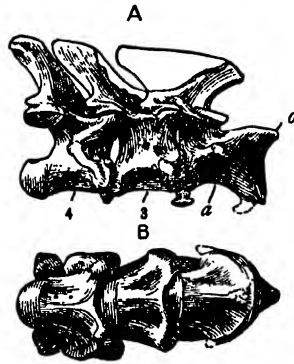


FIGURE 23.—Cervical vertebrae of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size: A, Lateral view; B, ventral view. a, Axis; o, odontoid; 3 and 4, third and fourth cervicals, respectively.

In the type the axis was found articulated with the third and fourth cervicals, and a detached vertebra appears to represent the fifth. The anterior end of the centrum of the axis is broadly expanded, with the odontoid of the atlas completely fused with it. The articular surface of this end is broadly rounded from side to side and is much deeper dorsoventrally than the axis of an *Iguana* of corresponding size. This face in the type has a greatest width of 11.25 mm. and a greatest depth of 8.75 mm., and the length of the centrum is 13.5 mm. Viewed from below, in front of the ball the centrum is regularly rounded from side to side, but the forward half is pinched together to form a sharp-edged process that projects downward on the median line (see B, fig. 23). This process may represent the fused axis intercentrum, although no trace of the line of coalescence is now discernible in any of the specimens. A small, rounded, spurlike, backward-directed diapophysial process is present on each side of the upper anterior end of the centrum. Prezygapophyses and postzygapophyses are well developed. The spinous process is incomplete in the type and has been restored in figure 23 from U.S.N.M. No. 15816. It resembles the neural spine of *Iguana*.

As in that genus, it strongly overhangs the anterior half of the centrum and presents a thickened anterior border that is slightly hollowed out longitudinally.

Cervical vertebrae posterior to the axis.—Six vertebrae are considered as constituting the complete cervical series. The type specimen has the second, third, fourth, and fifth cervicals preserved, whereas all are present in U.S.N.M. No. 15816. The principal modification to be observed between the third and sixth vertebrae, inclusive, is an increase in size of the diapophyses and a progressively more erect posture of the neural spines. The neural spines are relatively narrow anteroposteriorly, with a thickened posterior border and a sharp anterior edge. The top is thickened transversely, with a diagonally truncated end that in the posterior members of the cervical region is broadly notched. The sixth spine is perceptibly widened fore and aft. A small diapophysial process on the third cervical may have borne a small cervical rib, as indicated by the smooth articular surface of its end. This process on the fourth cervical is more robust, being elongated dorsoventrally and constricted near the middle, thus dividing the articular surface into two costal facets. These facets have a decided diagonal trend, the lower border projecting downward slightly below the level of the centrum on the fifth and presumably on the sixth cervical. The diapophyses reach their maximum size on the sixth. The centra are relatively short, subequal in size, evenly rounded on the ventral surface, and have a subcircular ball and cup. A heavy rounded ridge runs diagonally downward and backward from the top of the diapophyses to the edge of the ball. Below this ridge the side of the centrum is slightly excavated. The ridge joining the prezygapophyses and postzygapophyses is broadly hollowed out at the center. All these vertebrae have a well-developed zygantral-zygantrum articulation.

Intercentra are present in articulated position in specimen U.S.N.M. No. 15566, at the junction of the second and third and of the third and fourth cervicals, as clearly shown in plate 25. There are no distinct articulating facets for these elements, as in *Iguana* and *Cyclura*, their broadened bases resting smoothly across the junction of the centra. As mentioned previously, the downward-projecting process on the anterior ventral border of the axis may be a coalesced intercentrum.

As articulated, the five anterior vertebrae in specimen U.S.N.M. No. 15566 have a total length of about 64 mm.

Measurements of cervical vertebrae of the type (U.S.N.M. 15477) (in millimeters)

	2	3	4	5
Greatest length of centrum.....	10.5	10	10	10.75
Greatest transverse width across diapophyses.....	13	13.0	13.6	15.5
Greatest height over all.....	16	21.75	21.9	21.9

Dorsal vertebrae.—Including the one that is missing, the presacral series in specimen U.S.N.M. No. 15816 (pl. 25) consists of 23 vertebrae. The detailed description to follow is based, however, to a great extent on the vertebrae of specimen U.S.N.M. No. 15566, since they have been more completely freed from the matrix than those of the paratype. Seen from below, the centra are tapering in outline, depressed, with subovate condyle and a glenoid fossa. Nowhere is there evidence of a ventral keel or carina, the ventral surface being broadly rounded from side to side in the anterior part of the dorsal series and flattened in the posterior part. The series is greatly similar in structure throughout. The first and second dorsals have narrowed spines, but beginning on the third the neural spines are wide anteroposteriorly, with a nearly vertical posterior border and a long sloping anterior border. This style of spine, of uniform height, prevails to the twentieth vertebra. On the three posterior dorsals the anteroposterior diameter of the top portion of the spines suddenly contracts, and the tops are squarely truncate, with a very slight transverse expansion of this end.

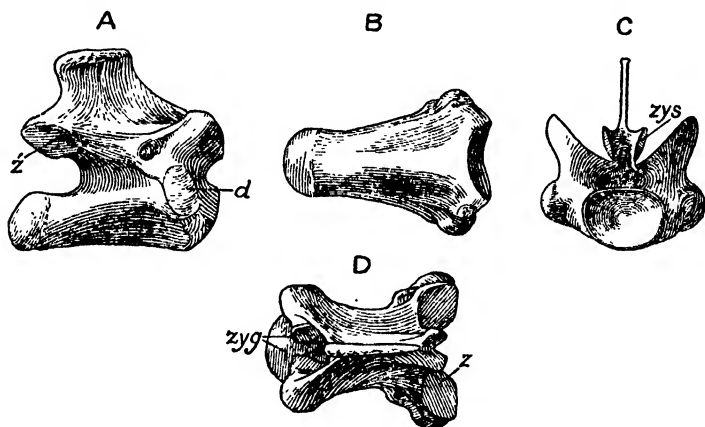


FIGURE 24.—Median dorsal vertebra of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15566, natural size: A, Lateral view; B, ventral view; C, anterior view; D, dorsal view. *d*, Diapophysis; *z*, anterior zygapophysis; *z'*, posterior zygapophysis; *zyg*, zygantrum; *zys*, zygosphenes.

The centra to the middle of the thoracic series gradually lengthen and then posteriorly continue with little change in length as far as the twenty-second dorsal. The twenty-third has the centrum decidedly shortened, as shown by the type specimen, which has the twenty-second, twenty-third, and sacrum articulated (see fig. 26). For example, measured along the center of the ventral side from the edge of the cup to the beginning of the ball the twenty-second is 14 mm., whereas the twenty-third or last dorsal is only 11 mm. in length.

Viewed from the side a prominent rounded ridge extends from the base of the diapophyses diagonally downward and backward, merging

into the centrum at the constriction for the ball. Below this ridge the side of the centrum is slightly hollowed out, this feature being most prominently developed in the anterior half of the series and tending to fade out in the direction of the sacrum. Above this ridge and between it and the less conspicuous ridge joining the prezygapophyses and postzygapophyses there is a slight excavation of the surface that widens posteriorly.

Anteriorly the diapophyses stand out prominently from the sides of the centra and are about equally supported by the centra and neuropophyses. The costal facets for the ribs on the anterior dorsals are subovate, with the longer diameter nearly vertical (see fig. 24). These facets gradually increase in size on the first five dorsals, remain subequal on the next three, and, beginning with the ninth or tenth, are progressively reduced in size and changed in outline from oval to semicircular (see fig. 25). A small zygosphenes-zygantrum articulation is developed on all the dorsals (fig. 24). These are more fully functional than the rudimentary stage found in the varanid lizard *Saniwa*.

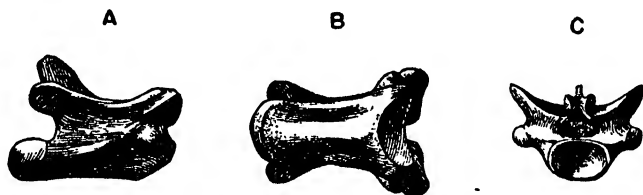


FIGURE 25.—Posterior dorsal vertebra of *Polyglyptanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size: A, Lateral view; B, ventral view; C, anterior view; spine largely missing.

Measured along the top the 23 dorsal vertebrae in specimen U.S.N.M. No. 15816 have a total length of about 350 mm.

Sacral vertebrae.—The sacrum consists of two vertebrae, and in none of the specimens is there indication of coalescence. The anterior sacral is slightly stouter than the posterior one and bears the heaviest sacral rib. These ribs are attached to the anterior two-thirds of the sides of the centra, their ventral surfaces being only slightly above the ventral level of the centra (see fig. 26). The ribs in all available specimens are completely coalesced, with no trace of their sutural union with the centrum.

Seen from below, the sacral centra are broadly rounded transversely and provided with the usual cup and ball. The spines are narrowed anteroposteriorly as contrasted with the wide spinous processes of the dorsals. Both vertebrae are provided with zygosphenes-zygantrum articulation in addition to the regular zygapophyses.

The sacral ribs are long, the rib of the first sacral projecting straight outward from the centrum, the rib of the second outward and forward, as shown in figure 26. The ventral surface of the second is indented

near its proximal end by a longitudinal groove that extends outward for a third of its length. The second ribs are slenderer than the first, and their outer ends are expanded, with the anterior edges abutting the posterior border of the first ribs and thus enclosing ovate sacral foramina. Viewed laterally, the ends of the ribs form the periphery of a half circle, thus forming a deep cavity between them that is open on the dorsal side.

Measurement of the sacra of the type (U.S.N.M. No. 15477) (in millimeters)

Greatest length of the two centra-----	33
Greatest width from tip to tip of the first sacral rib-----	62
Greatest height over all of sacral two-----	23

Caudal vertebrae.—The tail of *Polyglyphanodon* is represented by two articulated series of caudals and a few scattered vertebrae. Specimen U.S.N.M. No. 15817, which has the best-preserved section of the

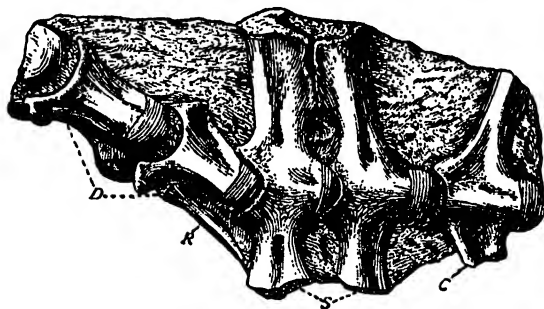


FIGURE 26.—Dorsal, sacral, and caudal vertebrae of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, ventral view, natural size: C, First caudal vertebra; D, dorsal vertebrae; R, last thoracic rib; S, sacral vertebrae.

tail, consists of $18\frac{1}{2}$ vertebrae that are in articulation with the sacrum, with parts of four others slightly separated from the last one of the series, as shown in plate 25. Specimen U.S.N.M. No. 15568 has an anterior caudal series of 22 vertebrae. A study of these two series seems to show that six anterior caudals are missing from U.S.N.M. No. 15568, so that we have knowledge of the first 28 vertebrae of the tail. The distal portion is missing in all specimens now available. In the restoration, plate 26, the missing portion of the tail has been restored after the *Iguana*, which *Polyglyphanodon* appears to resemble in many respects.

The first caudal vertebra has a centrum that is subequal in length with the last sacral and retains the depressed cup and ball of the pre-sacral region. The centra, beginning with the second, gradually increase in length posteriorly, but whether this lengthening continues into the distal portion of the tail cannot be determined from available materials. The first caudal has long, flattened transverse processes that extend outward horizontally from the sides of the centrum

with a decided backward inclination. On the succeeding caudals these processes grow progressively shorter until on caudal 15 only a faint spur remains. With the disappearance of the transverse processes the sides of the vertebrae are flattened, resembling those of *Iguana* in that respect. Zygapophyses are short and stout, and a well-developed zygosphenes and zygantrum are present in the anterior caudals, but how far they continue posteriorly cannot be determined. The spinous processes regularly increase in height to the neighborhood of the tenth caudal, reaching their maximum development there. From this point posteriorly they grow progressively shorter and become more slender. They also change in inclination in the first ten caudals from a type in which each strongly overhangs the succeeding vertebra to the nearly erect type of the tenth, which type then continues posteriorly.

On the ventral surface close to the beginning of the ball a pair of short articular protuberances indicates the points of attachment for the chevron.

CHEVRONS

The chevron bones of the anterior caudal region are long, slender, and subequal in length with the spinous processes. They articulate intervertebrately, but more especially with the anterior vertebra of each pair. The first chevron appears to be articulated with the third and fourth caudal instead of the second and third, as in *Iguana*.

RIBS

All the presacral vertebrae with the exception of the atlas, and possibly the axis, appear to have been rib bearing. The fifth cervical vertebra of the type specimen has the rib of the left side preserved in articulated position. It is short, having a head widely expanded dorsoventrally, with a cupped articular end that fully covers the elongated costal facet of the vertebra. The downwardly curved shaft tapers rapidly to a pointed distal end. Beginning well toward the proximal end on the median anterior surface an overhanging ridge projects prominently forward from this side. This ridge has a diagonal downward trend and merges into the outer ventral margin of the bone. Two cervical ribs belong to specimen U.S.N.M. No. 15568, one of which, as indicated by its smaller size, pertains to a cervical in advance of the fifth. It has a greatest length of 15 mm. On the left side of specimen U.S.N.M. No. 15816 cervical ribs 4 and 5 are preserved nearly in articulated position.

The thoracic ribs are best preserved in specimen U.S.N.M. No. 15816, as shown in plate 25. In all, 43 ribs are present, of which 30 are complete or nearly so, and practically all have been preserved articulated with their respective vertebrae. In specimen U.S.N.M. No. 15568 18 ribs are preserved; 9 of these on the left side are articu-

lated with the vertebrae, while 6 posterior ribs of the right side were found in such relationship as to be directly attributable to their proper places in the series.

The most anterior rib to be considered thoracic is articulated with the seventh vertebra in both specimens. It is thought to be the first rib to be connected with the sternum. It is on the basis of this evidence that the anterior six vertebrae are regarded as constituting the complete cervical series.

All the ribs are slender, single-headed, and curved gently nearly in one plane. On the anterior face of the proximal third of the anterior ribs is a longitudinal ridge that becomes progressively less and less pronounced but nowhere does this ridge overhang as in the cervicals. The posterior face for one-fourth of the length near the proximal end is traversed by a longitudinal groove. The ribs increase in length from the first to the thirteenth, and posterior to the thirteenth they shorten progressively. The length (in millimeters) of the complete ribs of specimen U.S.N.M. No. 15816 are as follows: First, 36; second, 41.6; third, 45; fifth, 55; eighth, 69; ninth, 71; tenth, 71; eleventh, 71, twelfth, 72.5; thirteenth, 74; fourteenth, 72.9; fifteenth, 62.4; twenty-third, 14.5.

The posterior ribs have nearly straight shafts, and there is a gradual reduction in size of the head from front to back. This reduction in the size of the head is in conformity with the diminution in size of the costal facets of the vertebrae. In the type the twenty-third or last rib is completely preserved *in situ* and has a greatest length of 12.5 m.

Thoracic ribs 9 and 10 of specimen U.S.N.M. No. 15816 show an exostosis of the bone on their upper thirds, suggesting that they had suffered injury and had healed in life. At the ends of several of the median ribs are ossifications that suggest strongly the presence of ossified sternal ribs. These may be plainly seen in plate 25.

PECTORAL GIRDLE

The ossified pectoral girdle is composed of the scapula, coracoid, clavicle, and interclavicle. Parts of the girdle are present in all the better-preserved specimens.

Scapula-coracoid.—The right scapula-coracoid of specimen U.S.N.M. No. 15559 is nearly complete, as shown in figure 27, and the detailed description to follow is based on this bone. The scapula is relatively broad and heavy for its length. The upper end is expanded, with a truncated end that is slightly convex anteroposteriorly. The missing portion of the end has been restored after specimen U.S.N.M. No. 15818. A small portion of the ossified suprascapula remains attached to this end, as shown in figure 27, *sec.* The sinuous posterior border is thickened and rounded throughout the greater part of its length;

the anterior margin thin and emarginated. There is only one emargination, but since the proscapular process is missing, its full extent cannot be positively determined.

On the external surface a strong rounded ridge is developed immediately above the glenoid border and extends diagonally upward to the middle of the upper end, terminating in a raised end short of the upper border. The glenoid end is much thickened, having a greatest transverse width of 8 mm. In this specimen the coracoscapular articulation is so fully fused that all trace of their union has been obliterated. In the scapula-coracoid of U.S.N.M. No. 15568, however, this suture is indicated as continuing nearly straight through from the glenoid fossa to the anterior edge of the scapula above the procoracoid process, ending at the base of the scapula-coracoid fenestra.

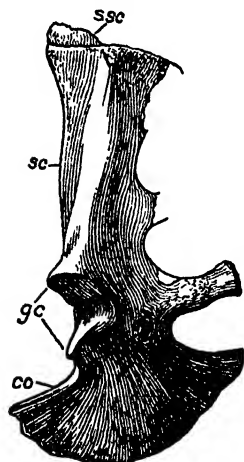


FIGURE 27.—Right scapula-coracoid of *Polyglyptodon sternbergi* Gilmore, U.S.N.M. No. 15559, natural size, lateral view: co, Coracoid; gc, glenoid fossa; sc, scapula; ssc, fragment of the proscapula.

The coracoid is complete in U.S.N.M. No. 15559, as shown in figure 27. The coracoid has a single fenestra, as contrasted with two in most members of the Iguanidae. Between the posterior border of this fenestra and the glenoid fossa the bone is perforated by a large coracoid foramen. The proglenoid process is thickened and rounded. The ventral border forms a long, sweeping, convex curve. The coalesced coracoid and scapula have a greatest length over all of 68 mm.; the upper end of the scapula has a greatest anteroposterior diameter of 14.5 mm.; greatest anterior posterior diameter of the coracoid is 31 mm.

The presence of a single emargination in the coracoid suggests relationship with the Agamidae, which generally have but one, *Uromastix* being an exception. However, little dependence as to relationship can be placed

on this feature, for, as pointed out above, most Iguanidae have double coracoidal emarginations. Yet here again there are exceptions, for in the terrestrial genera *Urocentrum*, *Sceloporus*, and *Phrynosoma*, and in the Anolidae, there is but one. Usually these emarginations are enclosed anteriorly by the cartilaginous coracoidal and scapular borders; sometimes they are simply open emarginations.

Clavicle.—Clavicle bones are present in five individuals of the present collection, but only two, U.S.N.M. Nos. 15816 and 15818, have the expanded perforate, lower ends preserved. The description to follow is based on the left clavicle of the paratype, U.S.N.M. No. 15816, which is preserved in nearly its normal articulated position.

The clavicle of *Polyglyphanodon* is a simple curved bar, perforated near its expanded lower end by a subovate fenestra. The upper portion is narrow, but the shaft gradually widens in a ventral direction. Approaching the fenestra the posterior border abruptly widens and then maintains its width to the truncated interclavicular end, as shown in figure 28.

The concave margin of this bone is slightly thickened and rounded, but the opposite side is thin, presenting a sharp edge for much of its length. The posterior side of the distal half is hollowed out longitudinally. Its greatest length measured in a straight line from end to end is 50.8 mm.

On the whole this bone bears a strikingly close resemblance to the clavicle of the iguanid lizard *Lacmancus*, the chief difference being in the more dorsal placement of the fenestra in the clavicle of the extant form.

Camp⁵ was of the opinion that broadly expanded, nonperforate clavicles are ancestral among modern Sauria and that simple rounded clavicles have been shaped from these. The perforate clavicle of the present specimen shows that this type originated very much earlier than was previously known and to that extent does not give support to Camp's conclusion.

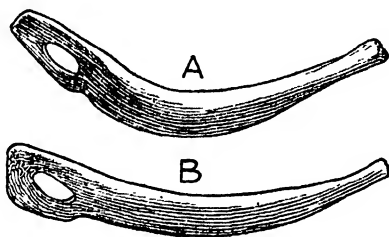


FIGURE 28.—Left clavicle of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15816, natural size: A, Oblique view drawn as it lay in the matrix; B, a direct side view.

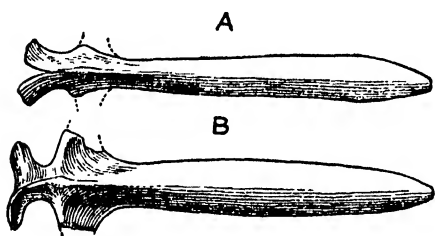


FIGURE 29.—Interclavicles of *Polyglyphanodon sternbergi* Gilmore, ventral views, natural size: A, U.S.N.M. No. 15559; B, U.S.N.M. No. 15568.

Interclavicle.—The interclavicle of *Polyglyphanodon sternbergi* may be described as cruciform, with a bifurcated anterior extremity and a long flattened posterior bar, the posterior end being obtusely pointed. This element is present in four specimens, U.S.N.M. Nos. 15559, 15566, 15568, and 15816,

all being slightly imperfect. The complete cross bar is preserved only in U.S.N.M. No. 15816, but in this specimen it is slender, with a slight curve posteriorly. Forward of this bar the shaft is constricted, but still farther forward it rapidly widens into two flattened divergent processes that are separated on the anterior end by a wide shall-

⁵ Camp, C. L., Classification of the lizards. Bull. Amer. Mus. Nat. Hist., vol. 48, p. 368, 1923.

low notch, as shown in figure 29, B. The interclavicle of U.S.N.M. No. 15566 differs in having a V-shaped notch that extends farther posteriorly into the bone. (Compare A and B, fig. 29.) On the ventral surface a sharp median keel develops at the posterior edge of the notch, continuing backward for a short distance before merging into the transversely rounded surface of this side. The posterior fourth of the bar is slightly spatulate in outline, terminating in a bluntly pointed end. Viewed from the side, this bone in front of the cross bar turns strongly upward.

Measurements of interclavicle (in millimeters)

	No. 15559	No. 15568
Greatest length.....	54	55
Greatest width, anterior end.....	9.0	11.5

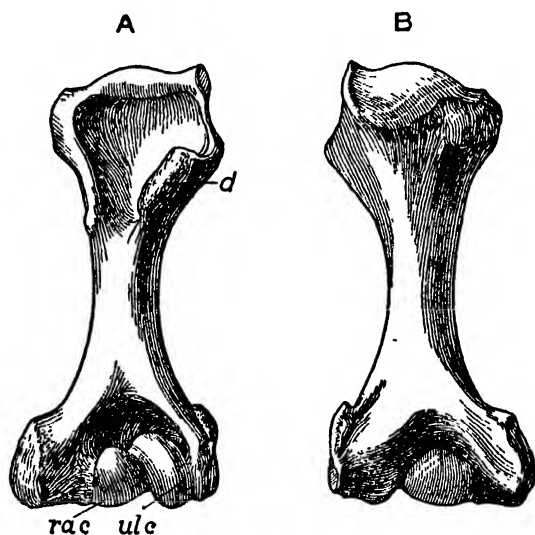


FIGURE 30.—Left humerus of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M., No. 15566, natural size: A, Anterior view; B, posterior view. *d*, Deltoid ridge; *rac*, radial condyle; *ule*, ulnar condyle.

FORE LIMB

Humerus.—In all there are 11 humeri preserved with the several specimens, six of which are nearly perfect. For purposes of illustration and description the left humerus of specimen U.S.N.M. No. 15566 is selected as being the most perfect, as shown in figure 30.

The humerus is of the "old-fashioned" reptilian type, broadly expanded at each extremity and joined by a slender shaft. The planes of the two ends meet each other at a slight angle, that of the proximal turned outward from the horizontal. The ends are more expanded than in either *Iguana* or *Cyclura*, and the shaft is relatively shorter

and stouter. The proximal articular facet, viewed from above, is subovate in transverse outline; its surface is moderately convex in both directions, but more especially anteroposteriorly and extending well backward on the posterior surface, thus indicating a more or less horizontal position of the bone in normal pose. There is a strongly developed deltoid ridge that is extended farther down on the shaft than in any of the Iguanidae. On the inner posterior surface near the upper articular end there is a roughened rugosity for muscular attachment. The anterior or ventral surface of this end is deeply concave. The deltoid ridge on the upper third of the bone when in natural pose looks strongly ventral. The articulations for the ulna and radius are turned strongly upward on the anterior surface of the distal end. The larger outer condyle for the ulna rises mostly from the ventral surface, the radial condyle is about subequal on both dorsal and ventral surfaces, as shown in figure 30. On the ventral side above these condyles the bone is excavated by a deep depression, as in *Cyclura*. This depression is only faintly indicated in *Iguana*. In the abrupt inward extension of the radial border the distal end has a decided resemblance to that in *Iguana tuberculata*. The shaft is nearly straight and subovate in cross section.

Measurements of humerus (in millimeters)

	No. 15566
Greatest length.....	61
Greatest width of proximal end.....	27
Greatest width of distal end.....	26
Least diameter of shaft.....	6

Radius and ulna.—There are seven complete ulnae and the proximal end of an eighth and five perfect radii in the collection, and except for a slight difference in size all are in close agreement. The description is based on the left ulna and radius of U.S.N.M. No. 15559 shown in figure 31.

The radius is a slender bone with subequal expanded ends. Its subovate proximal end is cupped for articulation with the radial condyle of the humerus. The shaft is nearly straight and subround in cross section. The lower distal end is diagonally truncate to the longer axis of the bone (see B, fig. 31), having a slightly cupped articular end.

The ulna is longer than the radius, with a stout olecranon process. Its proximal sigmoid surface is concave and extends upward on the

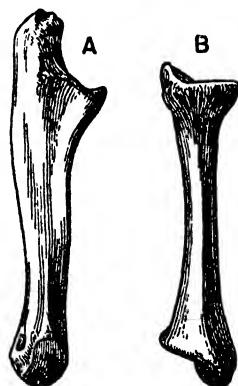


FIGURE 31.—Left radius and ulna of *Polyglyphanonodon sternbergi* Gilmore, U.S.N.M. No. 15559, natural size. A, Ulna, internal side view; B, radius, front view.

anterior face of the olecranon. The radial border of this end is concave. The whole bone tapers from above downward, the shaft is flattened transversely, the least diameter being on the lower third. There is but little expansion of the distal end. The convex articular surface of this end continues upward to an equal extent on both the anterior and posterior aspects. The posterior surface is abruptly backward from the shaft.

Such slight differences as are found in these bones of different individuals can be attributed to post-mortem causes.

Measurements of radius and ulna (in millimeters)

	Radius (No. 15559)	Ulna (No. 15559)
Greatest length.....	41.3	48.8
Greatest diameter of proximal end.....	10.0	12.3
Greatest diameter of distal end.....	10.5	7.4
Least diameter of shaft.....	3.6	3.4

Carpus.—The complete composition of the carpus of *Polyglyphanodon* is not shown in any of the specimens now available. The left carpus of the paratype, U.S.N.M. No. 15816, is probably the most complete, but in its present condition in the matrix as found it is quite impossible to differentiate fully its several elements. By a study of the carpal bones of all available specimens it has been possible to recognize the more important wrist bones. Specimen U.S.N.M. No. 15566 has the radiale attached to the distal end of the radius, thus definitely identifying this element. The radiale is the second largest bone in the carpus. It is of irregular shape, with a thinned anterior border, becoming thickened posteriorly, but more especially toward the outer end, which projects strongly downward and backward when in articulated position. On the anterior ventral surface at midwidth a distinct flattened facet indicates the point of articulation with centrale 1. External to this facet a notch represents the facets for centrale 2. The ulnare is easily recognized on account of its blocklike form and the fact that it is the largest bone of the carpus. It is assumed that there were five carpalia, but only one, the fifth, U.S.N.M. No. 15816, was found in articulated position. It is a small rounded element. The incomplete carpus outlined in figure 32 was drawn after that of the *Iguana*. The close resemblance of the carpal bones to the homologous elements of the *Iguana* carpus leads to the conclusion that when the complete carpus is known it will be found to resemble closely that of the living form.

Fore foot.—The manus is represented by the partially articulated right fore foot of specimen U.S.N.M. No. 15568 and the almost complete articulated left fore foot of the paratype, U.S.N.M. No. 15816, as shown in plate 25. In addition to these two articulated feet, several of the other available specimens had scattered portions of the

fore feet preserved. Unfortunately the most perfect manus is preserved in the matrix, palmar side up, and although it furnishes information as to the digital formula, it contributes but little evidence as to the front view of the hand. That shown in figure 32 is based largely on specimen U.S.N.M. No. 15568.

The metacarpals have about the same proportions as in *Iguana* of similar size. Metacarpal III is longest, II and IV being subequal in length, I being the shortest of the metacarpus.

The hand had the primitive formula 2, 3, 4, 5, and 3. The proximal phalanges of digits II, III, and IV are much shorter than the corresponding bones of the *Iguana* manus, in this respect having a general likeness to the feet of some of the Permian Reptilia. The phalangeals articulate with one another by a tongue and groove, the tongue being on the proximal end. The lower proximal surface extends well back in under the grooved distal end of the next preceding phalangeal. All the digits are clawed. The ungual phalanges are long, slightly curved dorsoventrally, and sharply pointed.

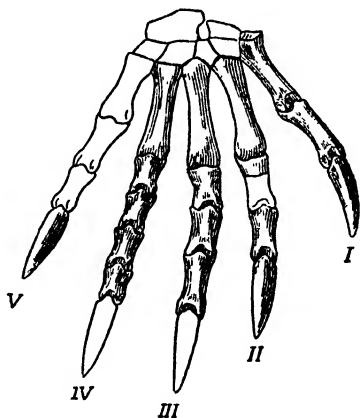


FIGURE 32.—Right fore foot of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15568, viewed from the front, natural size: I, II, III, IV, and V, digits 1 to 5, respectively. Digit V has been restored on the evidence furnished by specimen U.S.N.M. No. 15816.

Measurements of metacarpals of U. S. N. M. No. 15568 (in millimeters)

Greatest length of metacarpal I.....	10.3
Greatest length of metacarpal II.....	10.4
Greatest length of metacarpal III.....	10.7
Greatest length of metacarpal IV.....	10.3

The pelvis of the type specimen, U.S.N.M. No. 15477, is almost complete, lacking only distal parts of the pubes and a portion of the left ischium. The detailed description is based almost wholly on this specimen. Supplemental materials are the almost perfect pelves of U.S.N.M. No. 15568 and 15816, in articulated position (see pl. 25), and the left ilium, ischium, and pubis, the last lacking portions of its distal end, of U.S.N.M. No. 15566.

The pelvis as a whole displays no departures from the typical laceranian structure, differing only in certain details from the pelvis of the existing *Iguana*, to which it shows many resemblances.

Ilium.—When viewed from the side (see fig. 33) the ilium is produced as a rectangular bar upward and backward from the acetabular

portion. It is of moderate thickness, with a squarely truncated posterior extremity. Near the midlength a swelling outward of the upper and lower borders marks the point of attachment on the inner side of the sacral processes. The rectangular shape of the upper extremity of the ilium presents a marked difference from the tapering

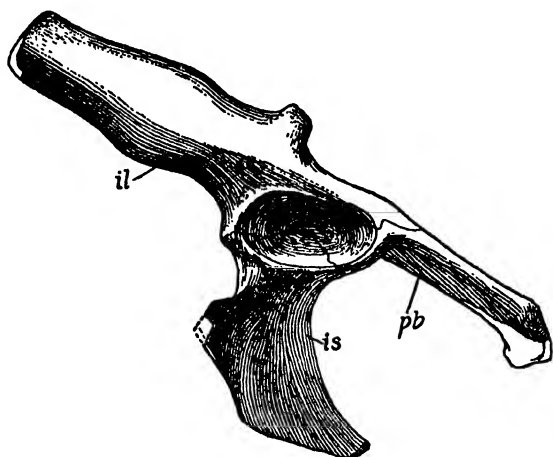


FIGURE 33.—Right half of the pelvis of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, viewed from the right side, natural size: *il*, Ilium; *is*, ischium; *pb*, pubis.

shape of the ilia of *Cyclura* and *Iguana*. On the lower half of the anterior border above the acetabulum, a heavy truncated process projects prominently upward and forward.

At the proximal end the heavy acetabular portion joins the ischium and pubis to form the subovate acetabulum, as shown in figure 33.

Ischium.—In articulated position the ischium extends almost directly downward and inward. Below the proximal end, which contributes to the formation of the acetabulum, the shaft is constricted, but it immediately expands into a wide, thin blade that is especially extended anteriorly as a tapering extremity. The distal end meets its fellow of the opposite side on the median line. None of the available specimens shows coalescence along this union, although in aged individuals such a union may be expected. In shape the ischium is iguanid-like in all particulars, resembling *Cyclura* more closely than the ischium of *Iguana*.

Pubis.—The pubis extends downward, forward, and inward from the acetabular end, and meets the pubis of the opposite side on the median line by a short symphysis. This inner end, however, is not expanded as in *Cyclura*. The upper posterior border is rounded and thickened from opposite the pubis foramen to the symphysis, forward of which the bone is very thin. Much of this thin portion is missing in all the pubes present, being most complete in specimen U.S.N.M. No. 15816 (see pl. 25). Near the acetabular end the bone is perforated

by the public foramen, which is located near the internal side. Constricted transversely below the acetabular end, the pubis widens rapidly but more especially toward the median line. The outer side is thickened and rounded along the border. The anterior or ventral border is without special thickening and turns inward from the lateral at nearly a right angle.

Measurements of pelvis of U.S.N.M. No. (15477 (in millimeters)

Greatest length from upper end of ilium to symphyseal end of pubis.....	83.0
Greatest length of ilium.....	45.7
Width of upper end of ilium.....	10.5
Width of expanded portion of ilium.....	15.0

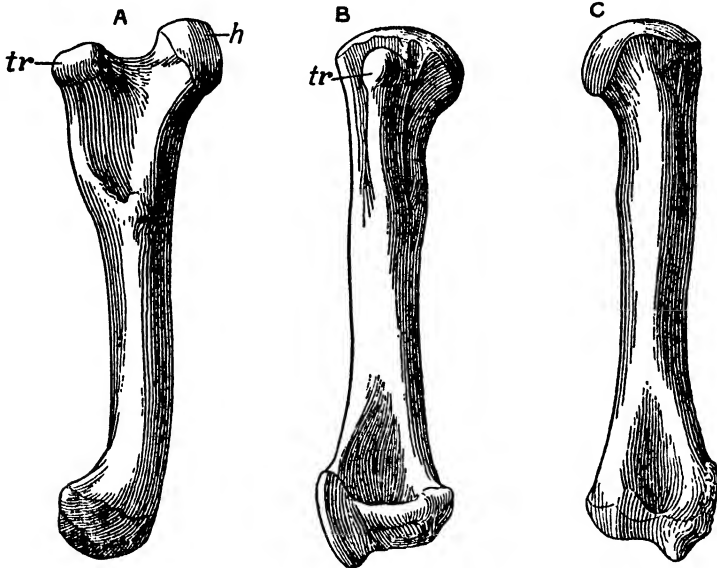


FIGURE 34.—Left femur of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size: A, Inner view; B, posterior view; C, anterior view. *h*, Head; *tr*, trochanter.

HIND LIMB

Femur.—In the several specimens of *Polyglyphanodon* available at this time 12 femora are preserved, as follows: two U.S.N.M. No. 15477, the type; two of No. 15816; two of No. 15566; two of No. 15568; one, lacking the proximal end, of No. 15559; two of No. 15817; and one of No. 15819. The description is principally based on the femora of the type specimen, shown in figure 34.

The femur when compared with an *Iguana* of corresponding size is stouter and has heavier articular ends. The great trochanter is robustly developed. It has at its extremity a small ovate facet directed proximally.

Between the trochanter and the head there is a broad shallow fossa that on the inner side extends downward for a distance of about one-

third the length of the bone. In the type femur this fossa has been exaggerated by crushing. The shaft at midlength is nearly circular in cross section, and the bone is nearly straight, except toward the distal end, where it bends backward.

The distal articular surface for the most part looks inward at an angle of about 30° and backward at about 45° . Of the articular surface, that part on the inner side for the tibia is much the broader, being set off from the fibular portion by a projecting ridge or condyle that turns strongly upward on the posterior face. The fibular articulation is principally with the outer side of this condylar projection. The intercondylar fossa is relatively shallow. The epiphyseal suture of the distal end is plainly visible, as shown in figure 34, A.

Measurements of femur of U.S.N.M. No. 15477 (in millimeters)

Greatest length.....	72.3
Greatest width of proximal end.....	22.0
Greatest width of distal end.....	17.8
Least diameter of shaft.....	7.7
Transverse diameter of head.....	14.2



FIGURE 35.—Right tibia and fibula of *Polyglyphanodon sternbergi* Gilmore, U.S.N.M. No. 15477, type, natural size: A, Tibia viewed from the front; B, fibula, lateral view.

Tibia.—The tibia is about three-fourths the length of the femur, with a much widened proximal extremity, a stout subovate shaft, and a moderately expanded distal end. In addition to the complete right tibia of the type (see fig. 35), and the distal end of the left, others belonging to seven individuals are in the collections. In the articulated limb the greater diameter of the proximal end is nearly anteroposterior in direction. The cnemial crest is not prominently developed, its outer surface is concave and its inner surface is convex. The condyles of this end overhang the posterior surface of the bone, more especially the outer one. The distal articular end is subovate in outline, with a slightly cupped surface on the outer

half, slightly convex on the inner. The shaft of the bone is practically straight.

Measurements of right tibia of U.S.N.M. No. 15477 (in millimeters)

Greatest length.....	52.9
Greatest width of proximal end.....	19.0
Greatest width of distal end.....	13.3
Least diameter of shaft at midlength.....	5.3

Fibula.—The fibula, although a slender bone, is stouter than that of an *Iguana* of corresponding size. It is distinctly longer than the tibia, and the planes of the two ends are slightly twisted with respect to one another about the longitudinal axis. Both ends are truncate diagonally to the longer diameter of the shaft. The proximal end is the most expanded, with a swelling out of the anterior border into a thin lip that turns inward. The upper articular surface is long and narrow and turns strongly downward on the inner side for articulation with the condyle of the femur. On the external side at the proximal end a rounded slightly raised projection marks the point of insertion of a ligament (see fig. 35). The distal end is little expanded anteroposteriorly but is thickened transversely. The articular end is convex, the articular surface extending upward on the internal side. In cross section the shaft is subovate in outline.

Measurements of right fibula of U.S.N.M. No. 15477 (in millimeters)

Greatest length.....	56.0
Greatest width of proximal end.....	11.7
Greatest width of distal end.....	10.0
Least diameter of shaft at midlength.....	3.4

Hind foot.—The structure of the hind foot is best illustrated by the left pes of specimen U.S.N.M. No. 15817, which has every bone present in articulated order, as shown in plate 25. Unfortunately the tarsus can be only partly exposed. This individual is the largest of any of the specimens now available; the femur measures 88 mm. in length as contrasted with 72.3 mm., the length of the femur of the type specimen. The hind foot illustrated in figure 36 is a composite based upon the hind feet of specimen U.S.N.M. No. 15568 preserved in nearly articulated position. Elements that are missing in one foot are usually present in the other, so that by a study of both it has been possible to determine the complete composition of the pes. The correctness of this restoration of the hind foot is now fully verified by the complete left pes of U.S.N.M. No. 15817, shown in plate 25, which came to hand after the drawing had been completed.

Unfortunately both tarsi were in a disturbed state and their complete structure is therefore rendered uncertain, a remark that applies equally well to specimens U.S.N.M. Nos. 15816 and 15817, shown in plate 25. It is for that reason that no attempt has been made to restore the complete tarsus in figure 36 further than illustrating those elements about whose identity there can be no doubt.

The tarsus consists of not less than six, possibly seven, bony elements. The proximal row consisting of the coalesced astragalus and calcaneum. These blocklike bones are so completely fused that their exact line of separation is difficult of detection.

The astragalus or tibiale plus intermedium is subquadrangular in shape when viewed from the front. The tibial articular surface is

subovate in outline and bifossate. The anterior face of this bone is concave with its upper and lower margins raised. The distal end presents a small rounded facet that looks forward and downward, and posterior to it a narrowed articular surface that extends upward on the posterior face for more than half its length.

The calcaneum is smaller than the astragalus, with a cupped articular upper surface for the fibula that is oblique to the longest planes of the

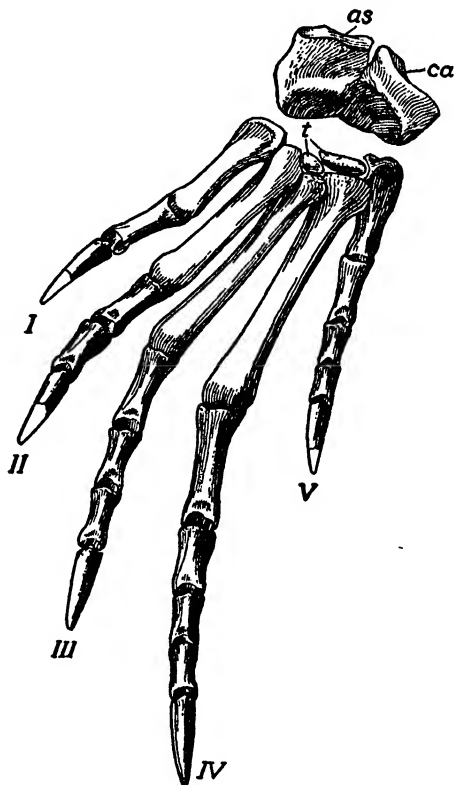


FIGURE 36.—Left hind foot and part of tarsus of *Polyglyptanodon sternbergi* Gilmore, U.S.N.M. No. 15568, natural size, restored from both hind feet [the astragalus and calcaneum (reversed) from type specimen, U.S.N.M. No. 15477]: *as*, Astragalus; *ca*, calcaneum; *t*, tarsalia 3 and 4; I, II, III, IV, and V, digits 1 to 5 respectively.

coalesced bones. The inner ventral surface is recessed by an oblique facet that looks downward and inward; a second smaller facet is present on the extreme outer distal end which probably articulated with tarsale 5. A flattened but irregular shaped element in the articulated right foot at the upper end of metatarsal IV and in articulation with metatarsal V probably represents tarsale 4. A small subtriangular element present in both hind feet at the end of metacarpal III is regarded as tarsale 3. Its position is shown in figure 36.

The five metatarsals increase in length progressively from the first to the fourth, which is the longest of the series. The fifth is the shortest and is further distinguished by the great winglike expansion of its upper end, as in *Iguana* and *Cyclura*. In the articulated foot this expansion of the fifth metatarsal extends inward behind metatarsal IV and articulates along its upper border with the cuboid, little if at all with the calcaneum. The fifth metatarsal is strongly bent, as in the *Chelonina*. In articulation the other metatarsals are somewhat imbricated, the dorsal margin overlapping the thinner inner side of the next outer bone.

The phalangeal formula is the primitive one of 2, 3, 4, 5, 4. All the digits are terminated by sharp compressed unguals. The metatarsals of U.S.N.M. No. 15568 have the following lengths: I, 18.3 mm.; II, 27.4 mm.; III, 33.5 mm.; IV, 36.0 mm.; V, 13.0 mm.

Insofar as comparison is possible, the tarsus of *Polyglyphanodon* shows the closest resemblances to that of *Iguana*. That remark applies equally well to the foot. The phalangeal formula, the relative length of the phalangeals, and of the digits as a whole, are in almost perfect agreement with the pes of *Iguana*. The only difference worthy of mention is that the individual elements are somewhat stouter than in an *Iguana* of equivalent size.

Patellar sesamoids.—A small diamond-shaped ossification attached by matrix to the posterior side of the distal end of the right humerus of specimen U.S.N.M. No. 15816 appears to represent the *patella ulnaris*. Its position *in situ* gives support to such a conclusion, for, as Camp⁶ points out, "the patella ulnaris lies in the tendon of insertion of the triceps which rides over the end of the humerus to reach the olecranon."

This sesamoid is partly bony in most of the *Ascalabota* and cartilaginous in most *Autoarchoglossa*. Fürbringer,⁷ however, is inclined to place little significance in either its form or distribution in lizards.

The *patella tibialis* is present in three specimens, U.S.N.M. Nos. 15816, 15817, and 15868. This is a small, irregularly shaped, ossicle-like bone that in most instances is attached by matrix to the distal end of the femur. In one instance it was found lying in the matrix between the proximal ends of the tibia and fibula.

A second but smaller ossification attached to the distal end of the right femur of specimen U.S.N.M. No. 15816 may be the fibular interarticular sesamoid, which is sometimes developed in the femoro-

⁶ Camp, C. L., Classification of the lizards. Bull. Amer. Mus. Nat. Hist., vol. 48, p. 408, 1923.

⁷ Fürbringer, Max, Zur vergleichenden Anatomie des Brustschulterapparates und der Schultermuskeln. Jenaische Zeitschr. Naturw., vol. 34 (new ser., vol. 27), pp. 443-444, 1900.

fibular ligament lying beneath the broad insertion tendon of the *rectus femoris* in which the *patella tibialis* develops.

FAMILY RELATIONSHIPS

Aside from the unique dentition, the skeletal features of *Polyglyphanodon* are essentially iguanid in character. The general structure of the skull, procoelous vertebrae with tapering centra, the presence of zygosphenes-zygantrum articulations on the vertebrae, absence of osteoderms, and foot structure are all features in accord with the Iguanidae.

Omitting consideration of the teeth and the method of implantation, none of the other structural differences observed, whether taken singly or collectively, are greater than exist between living genera now accepted by herpetologists as true members of the Iguanidae. The heterodont teeth implanted in shallow sockets and coossified with them, with no indication of replacement teeth, and the presence of a single emargination in the coracoid suggests agamid affinities, but the presence of a well-developed splenial covering most of the Meckelian groove is quite unlike the condition found in the agamid lower jaw, where the splenial bone is small or wanting, and the groove is open. In view of the fundamental differences displayed by the dentition, it is my conclusion that *Polyglyphanodon* cannot be logically included in the family Iguanidae, all of which have a homodont dentition with a pleurodont type of insertion in the jaws.

The zygosphenes, united premaxillae, and a well-developed splenial and angular showing but little on the outside of the jaw seem to exclude *Polyglyphanodon* from the Agamidae.

In view of the above facts I now propose the new family Polyglyphanodontidae for the reception of this new form, which appears to be a true member of the Ascalabota division of the Sauria.

RESTORATION OF THE SKELETON

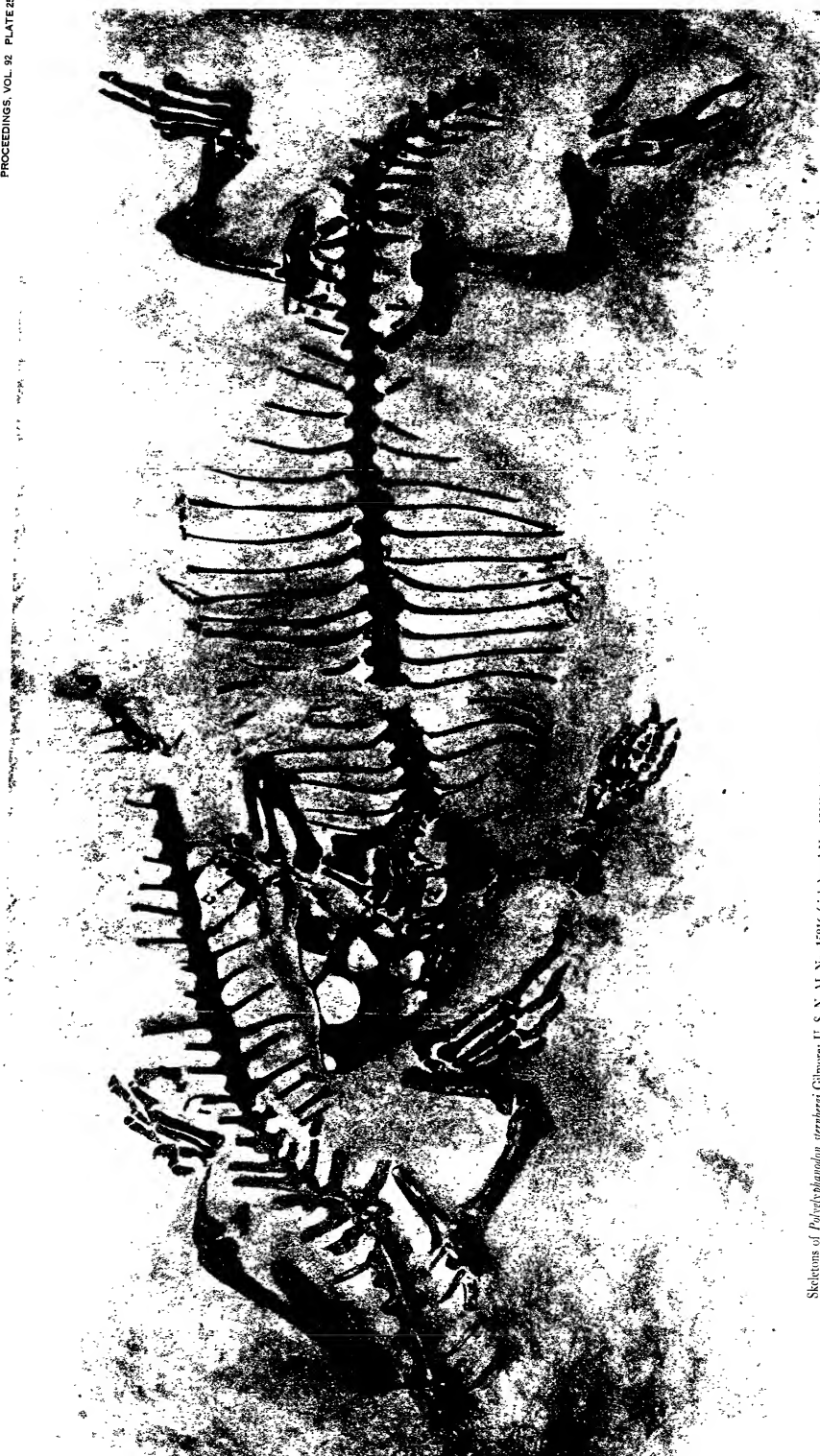
The restoration of the skeleton of *Polyglyphanodon sternbergi* shown in plate 26 is a composite based upon a careful study of all available materials. All are from a restricted locality, and with one exception all are of approximately the same size. Although parts of the skeleton have been illustrated from different individuals these have been coordinated as to proportions following the evidence of the excellent skeleton shown in plate 25.

The skull, lower jaws, sacrum, pelvis, and hind legs were drawn from the type, U.S.N.M. No. 15477. The presacral part of the vertebral column is for the most part based on specimen U.S.N.M. No. 15566, supplemented, of course, by the complete series of the articu-

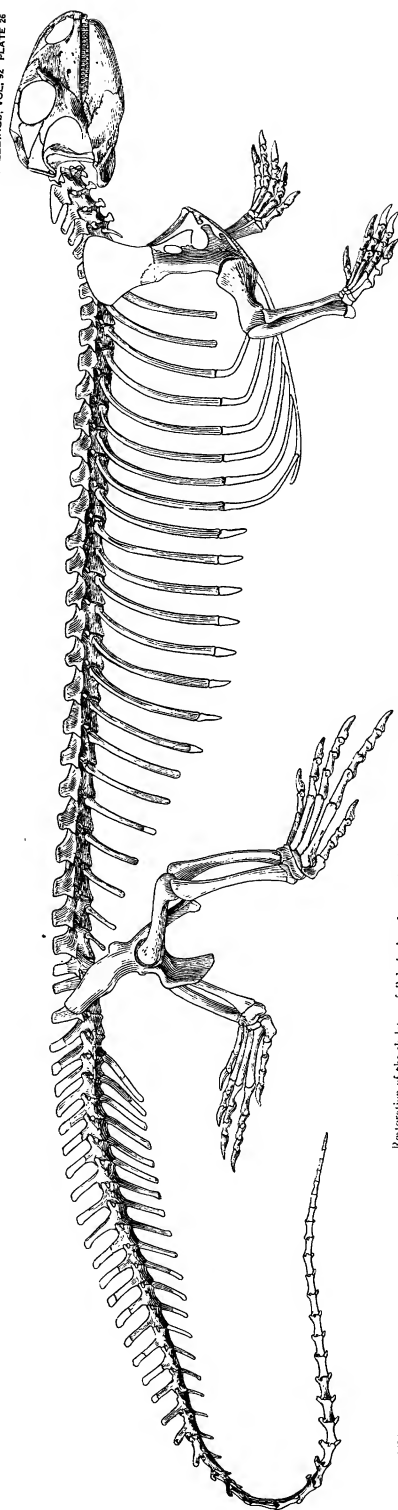
lated specimen U.S.N.M. No. 15816, which also furnished the information as to the character of the ribs. The anterior half of the tail was drawn from U.S.N.M. No. 15817, reduced to the desired scale, as this was the largest specimen in the entire collection. The fore and hind feet are based on articulated extremities of specimen U.S.N.M. No. 15568; the scapula, coracoid, clavicle, radius, and ulna on specimen U.S.N.M. No. 15559.

The distal half of the tail and portions of the carpus and tarsus are the only structures that were missing and could not be depicted from actual specimens. These missing portions have been restored in modified form after *Iguana*. The total number of caudal vertebrae depicted in the restoration is therefore conjectural. The tail on the restored skeleton has been turned forward in order to keep the plate within reasonable proportions. The skeleton as restored has an approximate length from tip to tip of 38 inches.

Taken as a whole the skeleton is typically lizard and, aside from the teeth, differs only in details from the skeletal structure of modern Sauria and not at all what one might expect in an animal of its geological antiquity. The teeth indicate quite conclusively that *Polyglyphanodon* was herbivorous in diet, and the long, strong, sharply pointed claws would seem to indicate that it was a terrestrial animal.



Skeletons of *Polygypharodon sternbergi* Gilmore; U. S. N. M. No. 15816 (right) and No. 15817 (left). These specimens are shown as they were found in articulated position. One-half natural size.



Restoration of the skeleton of *Polygyphodon sternbergi* Gilmore, based on the information furnished by several individuals. One-half natural size.



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NOTES AND NEW SPECIES OF MICROLEPIDOPTERA FROM WASHINGTON STATE

By J. F. GATES CLARKE

IN 1933, under the above title, I started a series of papers in which I proposed to deal with the microlepidopterous fauna of the State of Washington. Three of these papers have been published.¹ This paper, the fourth, contains descriptions of nine new species and one new genus, as well as notes on other miscellaneous species. In addition, four European species are recorded as new to North America.

The drawings for this paper were made by Arthur D. Cushman, staff artist, Bureau of Entomology and Plant Quarantine.

Family GELECHIIDAE

ANACAMPSIS POPULELLA (Clerck)

Phalaena populella CLERCK, Icones Insectorum, pl. 11, fig. 5, 1760.

E. I. Smith, Bureau of Entomology and Plant Quarantine, Seattle, Wash., submitted a series of this species for determination. Accompanying the moths was a series of larvae and pupae. The larvae were collected on a species of *Salix* and the moths were reared from them.

This appears to be the first record of the occurrence of this European species in North America. All specimens are in the United States National Museum.

¹ Can. Ent., vol. 65, pp. 84-93, 1933. Can. Ent., vol. 66, pp. 171-181, 1934. Can. Ent., vol. 67, pp. 244-254, 1935.

GNORIMOSCHEMA ARNICELLA, new species

PLATE 29, FIGURES 6, 6a; PLATE 32, FIGURE 14

Antenna sordid white annulated with blackish fuscous. Labial palpus sordid white shaded with gray on inner side of second segment, and irrorated with fuscous outwardly. Head, thorax, and fore wing pale cinereous, lightly shaded with pale brown and profusely, but finely, irrorated with fuscous. On the wing there are five blackish-fuscous spots, one at base of wing just inside costa, one on inner margin slightly farther out, one at one-third between 1b and the cell, another between the bases of 9 and 10, and a larger lunate spot at end of cell; cilia ochreous white strongly irrorated with blackish fuscous. Hind wing light gray, darker apically; cilia pale yellowish fuscous. Legs pale cinereous irrorated with fuscous. Abdomen cinereous, paler beneath.

Male genitalia.—Upper arm of harpe almost straight, nearly as long as uncus and tegumen combined; lower arm short, stout. Anterior process of vinculum about as long as lower arm of harpe. Gnathos a rather weak hook. Uncus well developed, rounded. Aedeagus stout, moderately dilated basally, distally with a dorsal protuberance.

Female genitalia.—Genital plate broad; ostium heart-shaped. Bursa copulatrix pear-shaped with a strong, slightly curved signum. Ductus bursae short, broad, with a narrow sclerotized ring before the ostium; inception of ductus seminalis at anterior edge of the sclerotized ring.

Alar expanse, 14–15 mm.

Type.—U.S.N.M. No. 56268.

Type locality.—Kamiack Butte, Whitman County, Wash., 3,000 feet.

Food plant.—*Arnica cordifolia* Hook.

Remarks.—Described from the type female (19–V–34, J. F. G. Clarke No. 5668); one female paratype, Newman Lake, Spokane County, Wash. (July 1915, G. K. Jennings); and one male paratype, Shasta Retreat, Siskiyou County, Calif. (August 16–23).

One paratype is in the Carnegie Museum, Pittsburgh, Pa.; the other paratype is in the United States National Museum.

The larva of this species is a leaf roller on the food plant.

LITA PRINCEPS (Busck), new combination

Gnorimoschema princeps BUSCK, Proc. Ent. Soc. Washington, vol. 11, p. 175, 1909.

The type of this species is in the United States National Museum. Although it is in poor condition, consisting of a fore and a hind wing, head without palpi, and two legs, it is easily recognizable as being a member of the genus *Lita* Treitschke. Vein 2 of the forewing is remote from 3, a character that distinguishes *Lita* from *Gnorimoschema* Busck.

In addition to the type, I have before me a series of eight specimens from Washington and Utah as follows: Washington: Pullman (23-IX-1925, J. F. G. Clarke); Wenatchee, 5 ♂ ♂ (23-29-VIII-1929, A. Spuler). Utah: Eureka, ♂ (27-VIII-1911) and Stockton, ♂ (29-VIII-1904), both collected by Tom Spalding.

The venation of the Washington and Utah specimens agrees with the type, and the genitalia definitely place these specimens in *Lita*.

In his paper on the restriction of the genus *Gelechia*² Busck retained this species in the genus *Gnorimoschema*. He undoubtedly did this, despite the obviousness of the venation, because of the inadequacy of the material before him.

ARLA, new genus

This genus is similar to *Lita* but differs from it in the extremely long antenna (thickened in the male), the long scaling from the uncus, armed aedeagus, and the single weak signum.

Genotype.—*Arla tenuicornis*, new species.

ARLA TENUICORNIS, new species

PLATE 30, FIGURE 9; PLATE 31, FIGURES 10-10b; PLATE 32, FIGURE 13

Antenna fuscous faintly annulated with gray. Labial palpus ochreous white strongly overlaid and irrorated with fuscous. Head luteous. Thorax and fore wing luteous profusely irrorated with fuscous, the surface of the wing appearing dull light brown. On the wing are three more or less well-defined fuscous spots, one between 1b and the cell before one-third, another at the base of vein 10, and the third at the end of the cell; cilia pale yellowish fuscous irrorated with fuscous. Hind wing fuscous; cilia pale yellowish fuscous. Legs ochreous white irrorated and overlaid with fuscous. Abdomen light fuscous above; ochreous white, irrorated with fuscous, beneath.

Male genitalia.—Upper arm of harpe very long, slender, dilated distally; lower arm long, slender, acutely pointed. Gnathos strong, sickle-shaped, with a prominent posterobasal protuberance. Uncus large, dilated posteriorly and edged with long scales. Vinculum with a well-developed, bifurcate posterior process with serrate edges and a long, bluntly pointed anterior process. Aedeagus long, slender, thickened and strongly armed at middle, and with a distolateral thorn.

Female genitalia.—Ostium broad, funnel-shaped. Bursa copulatrix rather small, oval; signum a weakly sclerotized plate. Ductus bursae long; posterior third sclerotized; inception of ductus seminalis slightly posterior to middle of ductus bursae.

Alar expanse, 17-23 mm.

² Busck, A., Proc. U. S. Nat. Mus., vol. 86, p. 571, 1939.

Type.—U.S.N.M. No. 56269.

Type locality.—Warwick, Klickitat County, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (9-VI-1931, T. M. Clarke) and five male and five female paratypes as follows: Shelton, Mason County, Wash., 1 ♂ (20-VI-1931, J. F. G. Clarke No. 2700); Shasta Retreat, Siskiyou County, Calif., 4 ♂♂, 5 ♀♀ (June 16-23, July 1-7).

CHIONODES LOETAE, new species

PLATE 30, FIGURES 8-8b; PLATE 31, FIGURE 12

Antenna blackish fuscous with faint ochreous-white annulations. Labial palpus ochreous white, more ochreous in brush, strongly irrorated with blackish fuscous outwardly and on third segment. Face and head pale gray brown. Thorax and fore wing rich chocolate brown with a purple iridescence (in some specimens the ground color is somewhat paler); apical fourth of wing almost solid blackish fuscous; in the cell three blackish-fuscous spots in a line; on vein 1b, at basal third, another similar spot (in most specimens the spots are pronounced but in some examples they are only faintly indicated); cilia pale fuscous with strong blackish-fuscous irrorations. Hind wing fuscous, cilia somewhat lighter. Legs ochreous white but the ground color almost obliterated by a strong blackish-fuscous suffusion.

Male genitalia.—Upper arm of harpe long, slender, acutely pointed; lower arm very weak, slender, small. Gnathos a long, evenly curved hook. Uncus rather large. Aedeagus stout with short stalk; distal end strongly sclerotized.

Female genitalia.—Ostium large, opening from the strongly sclerotized posterior portion of the ductus bursae; ductus bursae with only a short, membranous, anterior section. Bursa copulatrix large, pear-shaped, with the ductus seminalis opening into the posterior end; signum a strongly sclerotized, scobinate plate.

Alar expanse, 17-22 mm.

Type.—U.S.N.M. No. 56270.

Type locality.—Friday Harbor, San Juan County, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (16-VII-1926, T. C. Kincaid); three male and two female paratypes as follows: Bellingham (14-VIII-1930, J. F. G. Clarke No. 2943), ♂; Seattle (VI-27-1901, O. B. Johnson ?), ♂; (British Columbia; no date or collector), ♂; Bonneville, Clark County (16-VIII-1931, J. F. G. Clarke No. 2685), ♀; "British Columbia" (7-VIII-1905; no specific locality or collector), ♀. Paratypes in the United States National Museum.

CHIONODES WHITMANELLA, new species

PLATE 30, FIGURES 7-7b

Antennae dull ochreous white with narrow fuscous annulations. Labial palpus sordid white lightly irrorated with fuscous. Face and head sordid white with a suffusion of pale brown. Thorax and fore wing light yellowish brown. Thorax infuscated. Fore wing, especially toward tip, infuscated; in cell, about middle, two blackish-fuscous spots, one before the other; on vein 1b, slightly before basal third, a similar spot; cilia pale yellowish fuscous. Hind wing pale fuscous white, cilia pale yellowish fuscous. Legs ochreous white suffused and irrorated with fuscous. Abdomen pale brown suffused with fuscous beneath.

Male genitalia.—Upper arm of harpe slender, strongly curved, acutely pointed, reaching slightly beyond midpoint of tegumen; lower arm straight, slender, weak, somewhat shorter than upper arm. Gnathos very long, stout, curved. Uncus small. Vinculum with well-developed anterior process. Aedeagus long, slender, with a long stalk.

Alar expanse, 17–19 mm.

Type.—U.S.N.M. No. 56271.

Type locality.—Pullman, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (23-IX-1932, J. F. G. Clarke No. 4962) and two male paratypes as follows: (same data as type), ♂; Wenatchee, ♂ (12-IX-1929, A. Spuler).

In habitus *whitmanella* closely resembles species of the genus *Iso-phrictis* Meyrick.

FILATIMA ROCELIELLA, new species

PLATE 28, FIGURES 2, 2a

Antenna dark fuscous. Labial palpus sordid white; second segment suffused outwardly on basal part with fuscous and darkly shaded with dark ochreous in the brush; third segment lightly shaded with fuscous. Face, head, thorax, and fore wing sordid white. Head shaded with sordid yellow above. Base of tegula and fore wing strongly suffused with dark fuscous. Fore wing with a distinct, median, longitudinal fuscous streak suffused and irrorated with light ochreous; for almost the entire length of wing, along the veins, especially vein 12, are longitudinal ochreous streaks; cilia sordid white lightly irrorated with blackish fuscous. Hind wing pale fuscous; cilia yellowish, fading to white apically. Legs white irrorated and suffused with blackish fuscous. Abdomen yellowish above, white beneath.

Male genitalia.—Upper arm of harpe weak, slender, dilated distally; lower arm slightly curved, bluntly pointed. Gnathos a small, weak,

serrate hook. Aedeagus with one large and several small lateral projections.

Alar expanse, 17 mm.

Type.—U.S.N.M. No. 56272.

Type locality.—Quincy, Grant County, Wash.

Food plant.—Unknown.

Remarks.—Described from the unique type (13-IV-1930, J. F. G. Clarke).

This species cannot be confused with any other described North American species because of its distinctive character. It belongs in the group of *Filatima* having the curtain scaling from the underside of the costa of the hind wing.

FILATIMA ALBICOSTELLA, new species

PLATE 27, FIGURES 1-1b

Antenna fuscous. Labial palpus white; second segment, except upper inner edge, completely suffused with dark fuscous; third segment strongly overlaid with dark fuscous. Head and face shining whitish, the former irrorated and the latter strongly suffused with fuscous. Thorax blackish fuscous with a purple luster. Fore wing yellowish white strongly suffused and irrorated with fuscous except costal edge and with a purplish luster; in cell, on basal half of wing, a few ill-defined, blackish-fuscous streaks; cilia dirty white irrorated with blackish fuscous. Hind wing light purplish fuscous, darker toward margins; cilia pale fuscous. Legs white heavily overlaid with blackish fuscous. Abdomen fuscous above, white suffused with fuscous beneath.

Male genitalia.—Upper arm of harpe weak; lower arm longer than the upper, strong, with undulating ventral edge. Vinculum broad, excavated on posterior edge. Gnathos slightly curved, compressed distally. Aedeagus with a long, straight, divergent projection laterally.

Alar expanse, 18-19 mm.

Type.—U.S.N.M. No. 56273.

Type locality.—Pullman, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (21-II-1935) and two male paratypes (15-III-1933, 11-V-1925), all collected by the author. Paratypes in the United States National Museum.

This species belongs in the group of *Filatima*, which lacks the curtain scaling from the underside of the costa of the hind wing.

FILATIMA CUSHMANI, new species

PLATE 28, FIGURES 3-3c

Antenna fuscous with narrow gray annulations. Labial palpus grayish buff irrorated and suffused with blackish fuscous. Face buff; head pale grayish buff, the scales narrowly edged with fuscous. Thorax and fore wing grayish buff with a bronzy iridescence in some lights; from costa, near base, an ill-defined, outwardly oblique, broken blackish-fuscous line; from costa at basal fifth another similar ill-defined line to center of cell, thence longitudinally to the end of cell; at apical third, on costa, a faint indication of a blackish-fuscous spot; on costal fold, from base to basal third, a fine, broken, ochreous, longitudinal line; in cell, two distinct, dull-yellowish spots, with ochreous and black scales mixed; at basal third, on vein 1b, a similar spot; cilia pale yellowish gray, irrorated with blackish fuscous. Hind wing light grayish fuscous; cilia light yellowish fuscous. Legs ochreous white suffused and irrorated with blackish fuscous. Abdomen light yellowish fuscous above, ochreous white irrorated with blackish fuscous beneath.

Male genitalia.—Upper arm of harpe sharply bent ventrad and with a sharp ventral projection between the bend and base; lower arm rather short, fleshy, hairy. Gnathos a sharply bent, stout hook. Vinculum narrowed ventrally and with a well-developed anterior process. Aedeagus with an unusually large ventrolateral, flat, flared, toothed process on each side and a stout, moderately long, toothed dorsal process; base large and bulbous.

Alar expanse, 18–22 mm.

Type.—U.S.N.M. No. 56274.

Type locality.—Pullman, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (24-VII-1933, J. F. G. Clarke No. 4947) and two male paratypes as follows: 1, Yakima, Wash. (23-VII-1931, Fred P. Dean); 1, Johnson's Bar, Snake River, Idaho (10-IV-1926, J. F. G. Clarke No. 3190). Paratypes in the United States National Museum.

This species belongs in the group of *Filatima* without curtain scaling from the underside of the costa of the hind wing.

I take pleasure in naming this species for Arthur D. Cushman, who made the illustrations for this paper.

AROGA WEBSTERI, new species

PLATE 29, FIGURES 5-5c; PLATE 32, FIGURE 15

Antenna fuscous with lighter, narrow annulations. Labial palpus sordid white with irrorations and base of second segment fuscous.

Head and face sordid white, the former strongly suffused with gray above. Thorax and fore wing with sordid white ground color almost obliterated by grayish-fuscos suffusion and overlying grayish-fuscos scales; extreme base and two or three short, ill-defined, oblique costal dashes blackish fuscous; on lower fold, nearly to middle of wing, a blackish-fuscos longitudinal dash with a few ochreous scales mixed; in the cell at middle, a shorter dash followed by an ill-defined small spot of the same color; cilia sordid whitish suffused with gray and irrorated with blackish-fuscos. Hind wing light smoky fuscous; cilia light fuscous tipped with sordid white and with a distinct dirty-yellowish basal band. Legs whitish suffused and irrorated with blackish fuscous. Abdomen grayish fuscous above, sordid white suffused and irrorated with blackish fuscous beneath.

Male genitalia.—Terminal points of harpe as long as thickened basal portion. Posterior processes of vinculum long, slender, and acutely pointed. Uncus dilated and compressed posteriorly. Aedeagus curved in distal third, with a slender, curved lateral arm for attachment of vesica.

Female genitalia.—Ostium protruding, rounded. Signum weak, two of the four points poorly developed.

Alar expanse, 14–16 mm.

Type.—U.S.N.M. No. 56275.

Type locality.—Pullman, Wash.

Food plant.—Unknown.

Remarks.—Described from the type male (18–VII–1930), 1 ♂ (5–VIII–1932), and 4 ♀ ♀ (27–VII to 4–VIII–1932) paratypes from the type locality, all collected by the author. Type and paratypes in the United States National Museum.

The genitalia of this species most closely resemble those of *Aroga rigidae* (Clarke).

This species is named in honor of my friend and former professor, Dr. R. L. Webster, head of the department of zoology, Washington State College.

Family OECOPHORIDAE

BATIA LUNARIS (Haworth)

Recurvaria lunaris HAWORTH, Lepidoptera Britannica, pt. 4, p. 556, 1829.

In the course of making identifications of moths associated with studies on the Dutch elm disease, the apparent similarity between English specimens of *Batia lunaris* (Haworth) and a series of two males and three females from the State of Washington was noted. Further investigation and a comparison of the male genitalia of these with the English specimens and other European material proved them to be identical.

The Washington specimens were collected at Bonneville and Vancouver, Clark County, from June 26 to July 7, 1931, by the author.

This is the first record of the occurrence of this species in North America although probably it has been in the vicinity of Vancouver since the early settlement of the English on the Columbia River.

Family GLYPHIPTERYGIDAE

ANTHOPHILA PARIANA (Clerck)

Phalaena Tortrix pariana CLECK, *Icones Insectorum*, pl. 10, fig. 9, 1759.

Among material submitted for determination by C. F. Doucette, Sumner, Wash., was a large series of *Anthophila pariana* (Clerck). This species was formerly placed in the genus *Hemerophila*. The first record of its occurrence in North America was published by E. P. Felt³ under the title "Apple and Thorn Skeletonizer." In that paper the insect was listed from several localities in New York State. In the United States National Museum there are specimens from Connecticut, Rhode Island, New Jersey, and New York, but those received from Mr. Doucette from Washington represent the first known record of the occurrence of *A. pariana* in the western part of the United States.

Family HYPONOMEUTIDAE

ZELLERIA PYRI, new species

PLATE 28, FIGURES 4-4b; PLATE 31, FIGURE 11

Antenna blackish fuscous with narrow, sordid-white annulations. Labial palpus white, dusted with blackish fuscous exteriorly; tip of third segment ochreous white. Face white sparsely dusted with fuscous. Head ochreous white. Thorax white, heavily overlaid with lustrous black scales; tegulae with a reddish luster. Fore wing light brown variously marked with black and white; costa, from about basal third almost to apex, broadly margined by white dusted with black; on costa and inner margin, slightly beyond basal third, a black spot (in some specimens these spots are obliterated by their confluence with other black-margined scales); base of wing narrowly black; over veins 3 and 4, at their bases, a more or less distinct, short black dash; cilia fuscous, darker at apex. Hind wing shining dark grayish fuscous; cilia fuscous. Legs white, irrorated and overlaid with blackish fuscous. Abdomen fuscous above; white, irrorated with blackish fuscous, beneath.

Male genitalia.—Harpe ample, simple, broadest slightly beyond middle; cucullus broadly rounded. Anellus a simple broad band.

³ Jour. Econ. Ent., vol. 10, p. 502, 1917.

Vinculum with a long, narrow dorsoanterior process. Aedeagus long, slender, slightly wider apically than basally, bluntly pointed. Gnathos with a central tongue-like projection with a rough posterior surface. Socii long, digitate, sharply pointed.

Female genitalia.—Genital plate broad, strongly sclerotized, posterior edge concave. Ostium small, round. Bursa copulatrix large, oval, without signum. Ductus bursae membranous except for a thickened, sclerotized section in the posterior half; inception of ductus seminalis midway between the posterior end of this sclerotized part and the ostium.

Alar expanse, 12–16 mm.

Type.—U.S.N.M. No. 56276.

Type locality.—Puyallup, Wash.

Food plant.—*Pyrus* sp.

Remarks.—Described from the type male, 4 male and 8 female paratypes, all from the type locality (21–VI to 4–VII–1933, P. M. Eide).

This species is closely similar in pattern to *Zelleria parnassiae* Braun.

SWAMMERDAMIA PYRELLA (Villers)

Tinea pyrella VILLERS, Caroli Linnaei Entomologia, Faunae Suecicae descriptionibus aucta, vol. 2, p. 515, 1789.

In the course of making identifications of moths from Washington State, the study of the genitalia of a pair of Microlepidoptera from Bellingham proved them to be the European *Swammerdamia pyrella* (Villers), not previously recorded from North America. These moths were collected August 13, 1932, by the author.

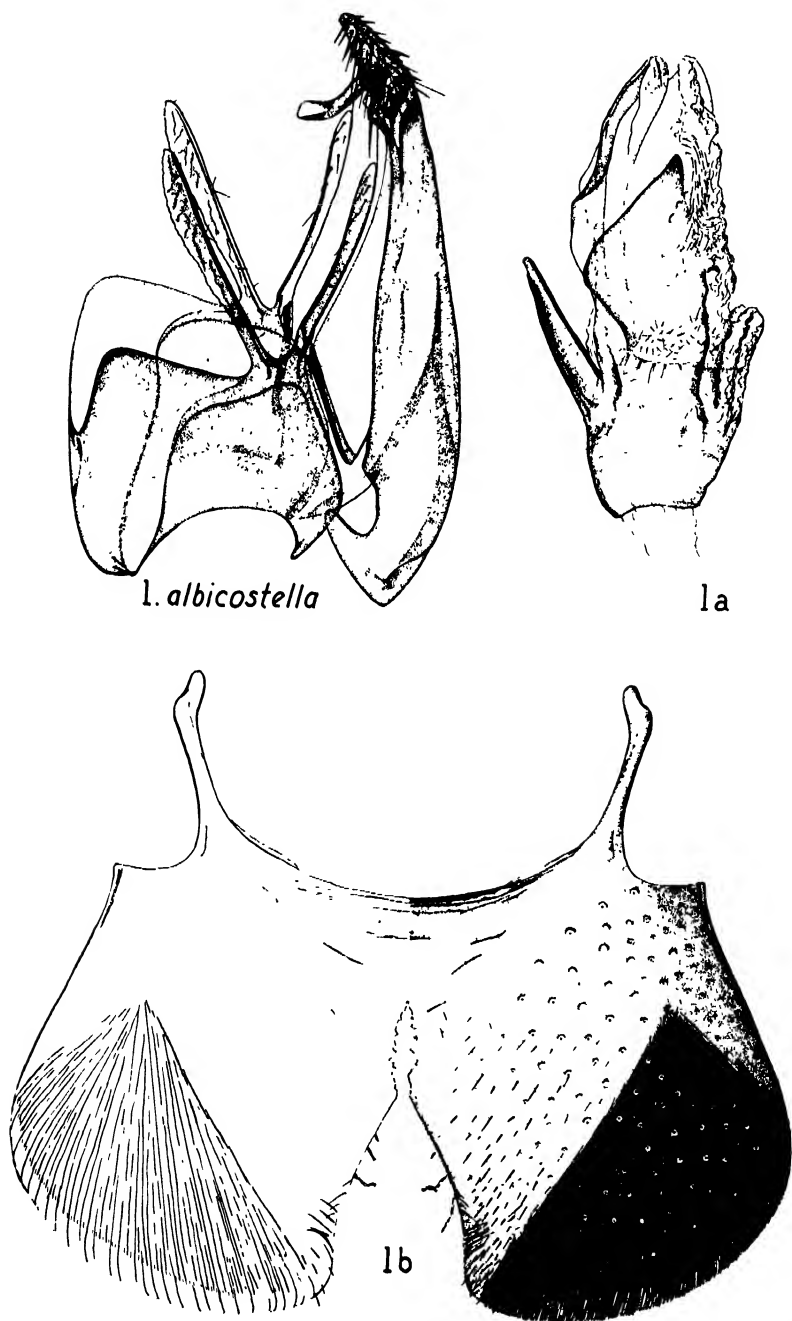
The larva feeds on the leaves of apple and prune.

Family ERIOCRANIIDAE

ERIOCRANIA SEMIPURPURELLA (Stephens)

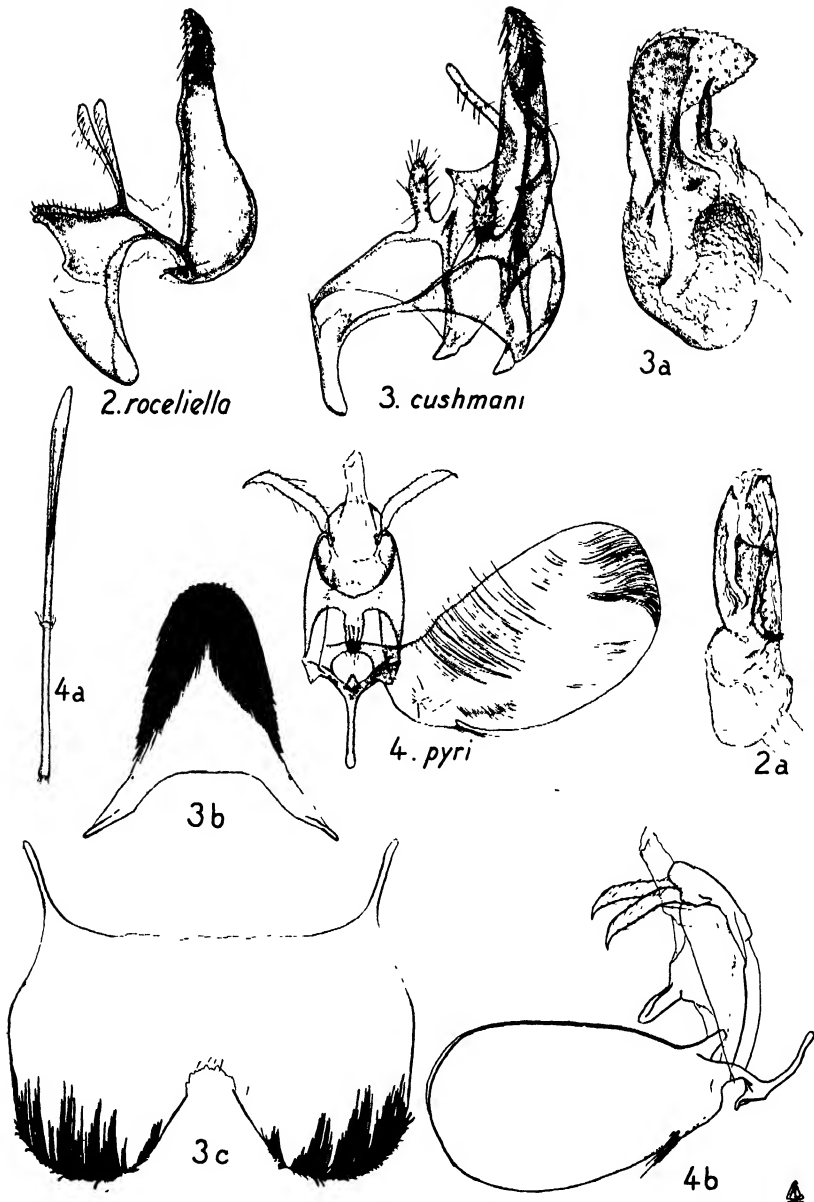
Lampronia semipurpurella STEPHENS, Illustrations of British Entomology, Haustellata, vol. 4, p. 359, 1835.

Before me is a series of four moths of this species collected at Bellingham (3–8–IV–1923, J. F. G. Clarke No. 3709–12) at light. Although these were collected many years ago, it has become possible to identify them only recently and to record the presence of this European species in North America for the first time. When the above specimens were collected, the species was abundant at light. I have not seen it since.



4

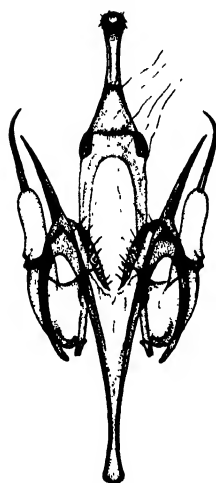
Filatima albicostella, new species: 1, Lateral view of male genitalia with aedeagus removed; 1a, lateral view of aedeagus; 1b, eighth sternite of male.



2, 2a. *Filatima roceliella*, new species: 2, Lateral view of male genitalia with aedeagus removed; 2a, lateral view of aedeagus.

3-3c. *Filatima cushmani*, new species: 3, Lateral view of male genitalia with aedeagus removed; 3a, lateral view of aedeagus; 3b, eighth tergite of male; 3c, eighth sternite of male.

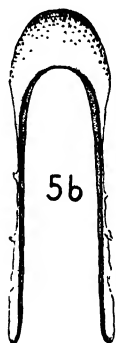
4-4b. *Zelleria pyri*, new species: 4, Ventral aspect of male genitalia with left harpe and aedeagus removed; 4a, lateral view of aedeagus; 4b, lateral view of male genitalia with aedeagus removed.

5. *websteri*

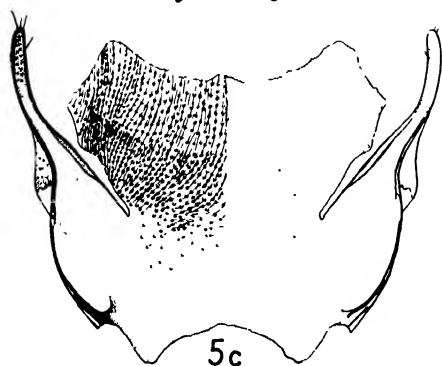
5a



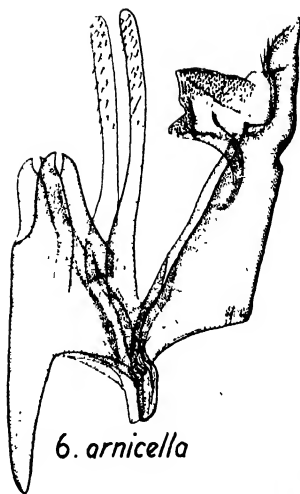
6a



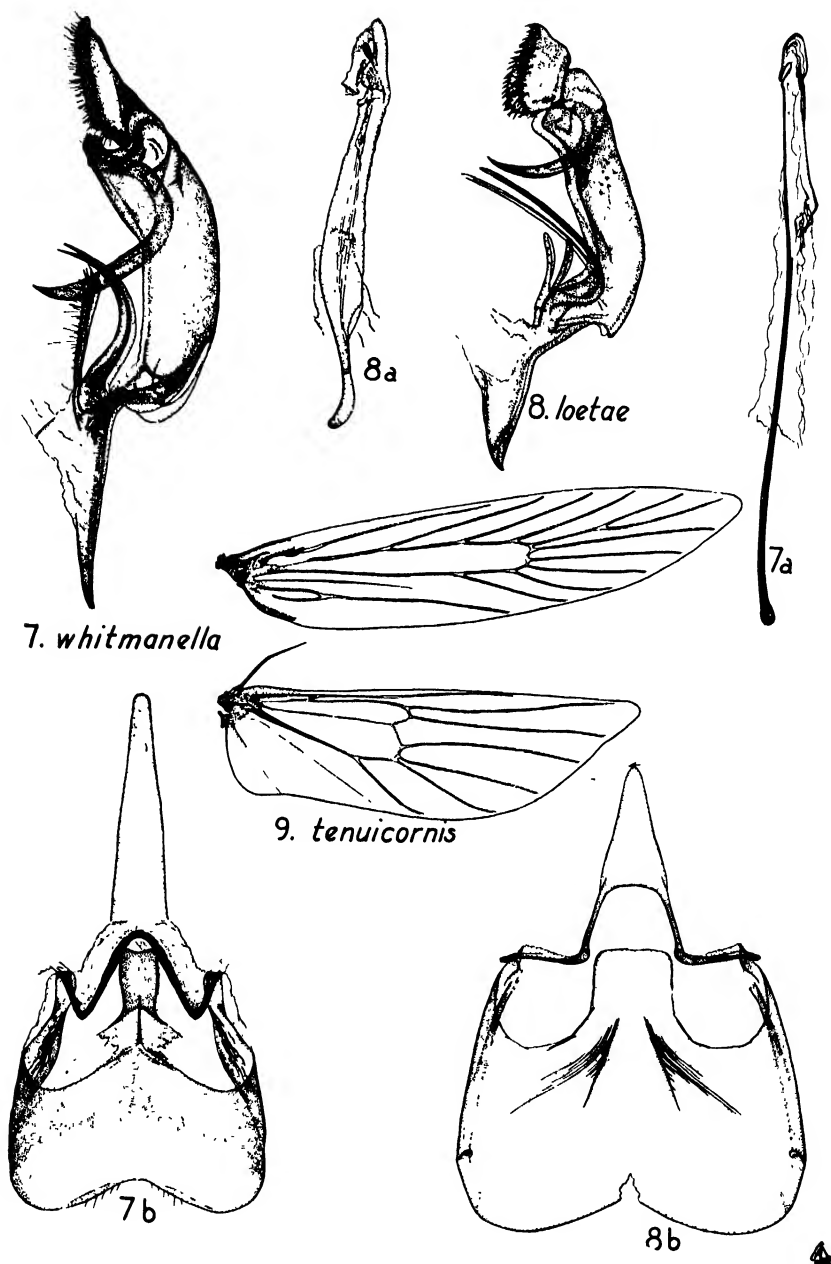
5b



5c

6. *arnicella*

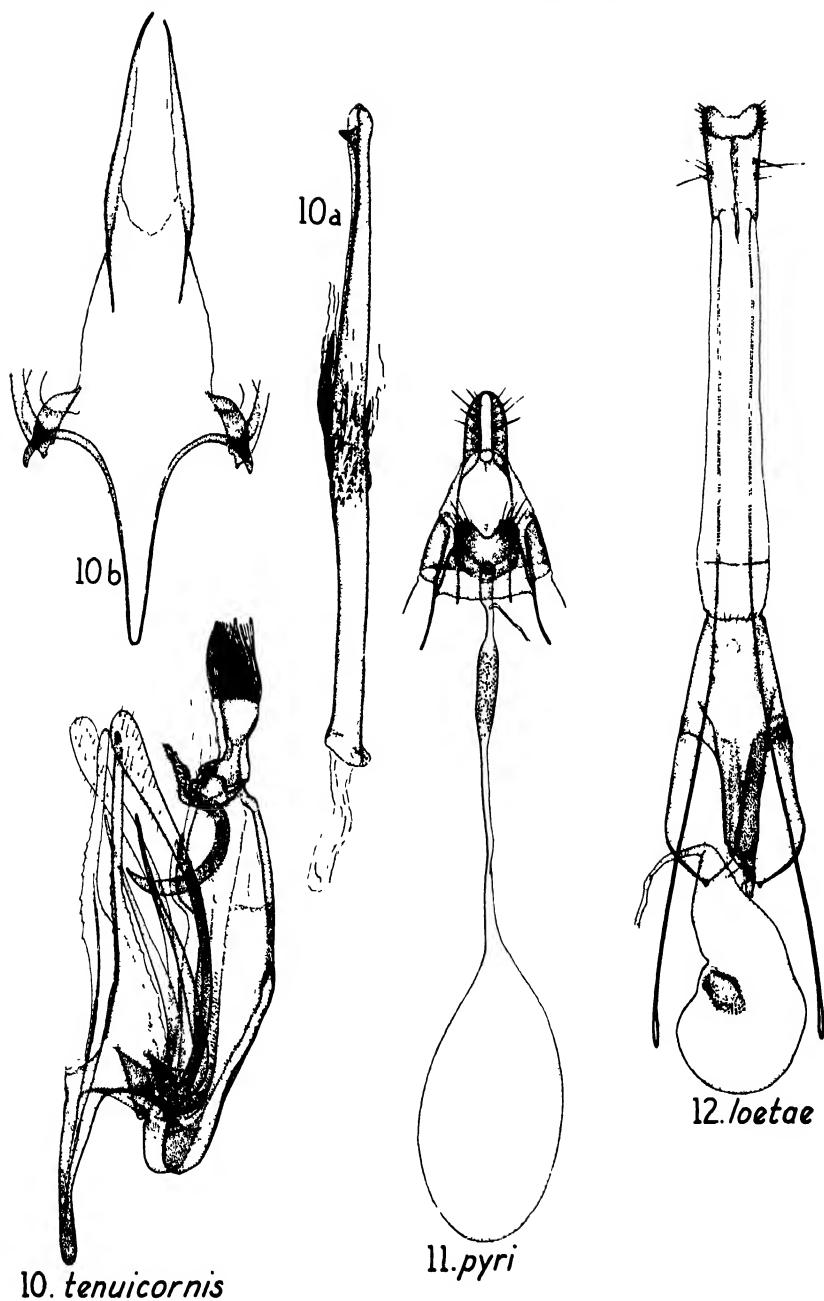
5-5c. *Aroga websteri*, new species: 5, Ventral view of male genitalia with aedeagus removed; 5a, lateral view of aedeagus; 5b, eighth tergite of male; 5c, eighth sternite of male.
 6, 6a. *Gnorimoschema arnicella*, new species: 6, Lateral view of male genitalia with aedeagus removed; 6a, lateral view of aedeagus.



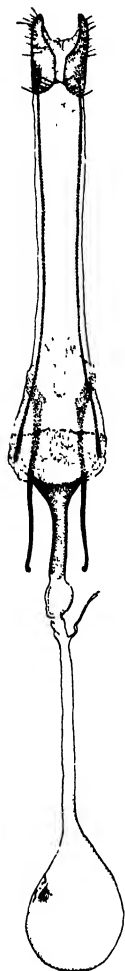
7-7b. *Chionodes whitmanella*, new species: 7, Lateral view of male genitalia with aedeagus removed; 7a, lateral view of aedeagus; 7b, eighth tergite and sternite of male, articulated.

8-8b. *Chionodes loetae*, new species: 8, Lateral view of male genitalia with aedeagus removed; 8a, lateral view of aedeagus; 8b, eighth tergite and sternite of male, articulated.

9. *Arla tenuicornis*, new species: Wing venation.



- 10-10b. *Arla tenuicornis*, new species: 10, Lateral view of male genitalia with aedeagus removed; 10a, aedeagus, lateral view; 10b, ventral view of vinculum.
 11. *Zelleria pyri*, new species: Ventral view of female genitalia.
 12. *Chionodes loetae*, new species: Ventral view of female genitalia.



13. *tenuicornis*



14 *arnicella*



15. *websteri*

13. *Arla tenuicornis*, new species: Ventral view of female genitalia.
 14. *Gnorimoschema arnicella*, new species: Ventral view of female genitalia.
 15. *Aroga websteri*, new species: Ventral view of female genitalia.

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THE GENOTYPES OF SOME OF ASHMEAD'S GENERA OF ICHNEUMON-FLIES

By R. A. CUSHMAN

IN THE keys to his Classification of the Ichneumon Flies, Ashmead¹ proposed 21 genera with so-called manuscript species designated as genotypes. That is, these genera and their genotypes were described only by the key characters leading to the genera. Some of these have since been more fully described by Ashmead or by other authors, but several are still in their original status. One genus, ostensibly of this sort, was described by Ashmead prior to 1900.

In the following pages I shall indicate the relationships of these genera and redescribe the genotypes that have not already been redescribed.

Genus ZONOCRYPTUS Ashmead

Zonocryptus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 40, 1900. (Genotype, "*Cryptus sphingis* Ashmead, manuscript," monobasic.)

The genotype was said to be from Africa. The only specimen in the collection in the United States National Museum that fulfills all the requirements of character and habitat is a male labeled "Ex sphinx chrysalis from Central Africa, I. Helen Moffat (Denton)" and bearing the name label "*Cryptus formosus* Br." in Ashmead's handwriting. There can, I think, be no doubt that the genus *Zonocryptus* was based on this specimen.

¹ Proc. U. S. Nat. Mus., vol. 23, pp. 1-220, 1900.

As thus typified, *Zonocryptus* falls within the limits of *Oncilella* Cameron as treated by Waterston¹. In Waterston's key to males the above-mentioned specimen runs to *rufopetiolata* Waterston, but disagrees with most of the characters in the formal description of that species. It does agree in the form of the areolet as described in the key to females.

It seems likely that *Oncilella* as treated by Waterston is a composite genus, a possibility suggested by Waterston himself. If such proves to be the case, *Zonocryptus* would include those species in which the sides of the areolet converge toward the radius with the first intercubitus much more oblique than the second. Too little material of the group is before me to justify the synonymizing of *Oncilella* with *Zonocryptus* or the transferring of any species from the one to the other.

ZONOCRYPTUS SPHINGIS (Ashmead)

Male.—Length 14 mm.

Head polished, impunctate except finely and sparsely so on face; temples strongly convex, nearly as broad as eyes anteriorly; inner margins of eyes convexly curved, frons broadening dorsally and face ventrally; frons deeply concave, but not carinately bordered laterally; face slightly elevated medially; clypeus strongly convex in middle, its apical slope steep and with a blunt tooth; malar space three-fourths as long as basal width of mandible; mandible twice as broad at base as at apex, finely and irregularly rugulose, upper tooth longer and more acute than lower tooth; second joint of maxillary palpus broad and nearly parallel-sided; with a rounded protuberance on apical exterior angle; antenna (both broken) with first joint of flagellum nearly a half longer than second joint, others gradually diminishing in length, subapical joints transverse.

Thorax punctato-rugose laterally, polished and virtually impunctate dorsally; mesoscutum with a low, median, triangular elevation anteriorly, notaulices fine and shallow; scutellum sloping nearly from base, subacute at apex, fovea deep and bounded laterally by very high carinae; propodeum coarsely reticulate-punctate, basally nearly smooth, and apical slope irregularly rugose, spiracles elongate oval; pronotum smooth above, obliquely striate in scrobe; speculum polished, prepectoral carina incomplete above, sternaules short and broad. Wings broad; stigma narrow with radius basad of middle; basal vein straight; ramellus very short, the two abscissae of discocubitus straight; areolet small, pentagonal, higher than long, intercubiti strongly convergent, the first much more strongly oblique than

¹ Bull. Ent. Res., vol. 18, pp. 191-204, 1927.

second; nervulus postfurcal, the vein between it and basal very strongly oblique; abscissula and intercubitella equal in length; nervellus sharply broken at lower fourth. Legs long and slender; coxae sparsely punctate; femora, tibiae, and tarsi with dense, very short pubescence, the last two with scattered, minute spines, tarsi slender, each succeeding joint more slender than the preceding.

Abdomen polished, sparsely and minutely pubescent; postpetiole about a half wider than petiole; second segment equal in length to first; squama of genitalia thick and opaque.

Black; head, mandibles, scape, pedicel, and broad anterior margin of pronotum ferruginous; flagellar joints 10 to 14 pale; wings brownish, front wing with a broad hyaline band extending from base of stigma to about apical third of radial cell and nearly to posterior margin; hind wing hyaline along folds and in middle of brachiellian cell; tergites 5 to 8 white and submembranous apically, 7 and 8 so nearly to bases medially.

Type locality.—Central Africa.

Host.—"Sphinx chrysalis."

Type.—U. S. N. M. No. 56287.

A single male specimen taken by I. Helen Moffat.

Genus METARHYSSA Ashmead

Metarhyssa ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 40, 1900. (Genotype, *M. bifasciata* Ashmead, monobasic.)

The genotype was recorded as from Africa. In the collection in the National Museum are two male specimens from Africa labeled by Ashmead "*Opisthorhyssa bifasciata* Ashm." that run to *Metarhyssa* in Ashmead's key. There appears no doubt that these specimens constitute the basis of the description of *Metarhyssa*, and that Ashmead changed to *Metarhyssa* to avoid confusion between *Opisthorhyssa* and *Opisorhyssa* Kriechbaumer, 1890. It should be noted that in *Opisthorhyssa* (behind+rugose) Ashmead undoubtedly referred to the same character as in *Metarhyssa* (between+rugose), that is, the transversely striate "metathorax." The specific name "*bifasciata*" is an obvious *lapsus* for *bifasciata*.

As thus typified, the genus belongs to that group of genera of the Cryptini characterized by truncate clypeus with or without a median tooth, rather long propodeum with at most the basal carina, first tergal spiracles placed at or near the middle, and, in the female, by inflated front tibiae and long seventh and eighth tergites. Other members of this group are *Echthrus*, *Agonocryptus*, *Torbdia*, *Xoridescopus*, etc.

METARHYSSA BIFASCIATA Ashmead

Male.—Length 14 mm., antenna 14 mm.

Body and legs with long, slender hairs especially on head, thorax, first abdominal segment, and hind coxae.

Head polished, face and frons partly transversely striate; temples short and convexly receding; eyes slightly converging below; clypeus with a few large punctures, truncate, with a median apical tooth; malar space half as long as basal width of mandible; antenna very slender, filiform, with short, stiff, vertical pubescence and sparser, appressed pubescence.

Thorax slender, polished, with scattered, coarse punctures on pre-scutum, mesopleuron, and metapleuron, the propodeum transversely striate except at base, without carina, spiracles elongate oval; pronotum with a few punctures in humeral angle; notaulices deep and meeting on disk, the lobes very strongly convex; prepectoral carina nearly complete above. Wings: Stigma exceedingly narrow with radius far before middle; areolet small, quadrangular, the intercubiti meeting, first intercubitus more strongly oblique than second; nervulus antefurcal; nervellus broken at lower third, reclivous. Legs very slender.

Abdomen slender; first tergite with hairs erect, spiracles before middle, postpetiole gradually broader than petiole.

Black; inner and lower posterior orbit narrowly whitish; mandibles and clypeus reddish piceous; antenna with a small whitish annulus beyond middle; legs piceous, front and middle tibiae narrowly whitish basally and the front tibia anteriorly, hind tarsus whitish except at extreme base and apex; wings hyaline, with apical fourth, a broad band at about middle of front wing and a corresponding but incomplete band on hind wing brown.

Type locality.—Mt. Coffee, Liberia.

Type.—U.S.N.M. No. 56288.

Two males taken in February 1897 by Rolla P. Currie.

Genus OPISOXESTUS Ashmead

Opisoxestus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 40, 1900. (Genotype, *O. ferrugineus* Ashmead, monobasic.)

The single female specimen on which this genus was based lacks the head, right hind wing and hind leg, and part of the right front leg. It is a species of *Joppidium* in which the only sculpture consists of striation and foveolation in the pronotal scrobe and along the sutures and furrows. On the label the generic name is spelled "*Opisthoxestus*", which makes evident Ashmead's intention to derive the name from *ὀπίσθε* (behind) and *ξεστός* (polished) in reference

to the highly polished propodeum, not as Dalla Torre has interpreted it, *ὀπισω* (backward) and *Xestus* (a proper name).

(*Opisowestus* Ashmead) = *Joppidium* Cresson. New synonymy.

JOPPIDIUM FERRUGINEUM (Ashmead), new combination

Opisowestus ferrugineus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 40, 1900.

Female.—Length (estimated) 14 mm., ovipositor sheath 6.5 mm.

Head (missing).

Thorax polished, striate or foveolate in pronotal scrobe and along all sutures and furrows; propodeum with only faint lateral traces of basal carina.

Abdomen polished, finely and densely pubescent.

Ferruginous; wings deep black with purple reflections; front and middle legs concolorous with body, the tarsi darker; hind leg, except coxa, piceous to black; first tergite broadly, others narrowly blackish apically.

Type locality.—Ecuador.

Type.—U.S.N.M. No. 56289.

I have seen only the type.

Genus CRYPTOPTERYX Ashmead

Cryptopteryx ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 42, 1900. (Genotype, *C. columbianus* Ashmead, monobasic.)

This genus was based on a single female in the National collection. Both wings on the right side, the antennae, and most of the tarsi are gone.

Except for the long propodeal apophyses, somewhat prominent clypeus, and only slightly convergent areolet the genus seems to me to be rather closely related to *Cryptus*. In fact, if at couplet 14 in the key to the Cryptini the clypeus, the form of which is merely an exaggeration of the convexity of the clypeus of *Cryptus*, be considered as not toothed or angulated, the type will run to *Cryptus*, agreeing very well with all characters. It also agrees with *Cryptus* in its concave frons, long epomia, distinct notaulices, complete prepectoral carina, strongly convex scutellum, slender antennae, subbasally swollen femur, long narrow radial cell, and sagittate ovipositor.

CRYPTOPTERYX COLUMBIANUS Ashmead

Female.—Length 11 mm., ovipositor sheath 2.5 mm.

Body mat and with short, very dense, fine, golden pubescence.

Head strongly transverse, temples flat and strongly receding; occiput and frons rather deeply concave, frons with a median carina;

eyes large and nearly parallel; clypeus in profile somewhat nasute; malar space nearly as long as basal width of mandible; antenna (of another specimen) very slender filiform, nearly as long as body.

Thorax deeper than broad; epomia reaching nearly to dorsal margin of pronotum, scrobe obliquely striate; scutellum briefly margined basally; mesopleuron, metapleuron, and sides of propodeum obliquely striate, carina between metapleuron and propodeum obliterated; propodeum rugulosely punctate, apically somewhat transversely striate, basal carina sharply angulate toward base medially, apophyses very long, conical. Wings as in *Cryptus* except that apical abscissa of radius is strongly curved, areolet is weakly convergent, and upper abscissa of nervellus is straight. Legs long, slender, as in *Cryptus*.

Abdomen slender; first segment slender, without carinae, postpetiole about twice as broad as petiole, latter slender with tergite and sternite confluent.

Ferruginous; head mostly yellow; wings uniformly yellow hyaline; antenna (from another specimen) yellow with apical third black; legs concolorous, with hind tarsus (from another specimen) yellow except base of first joint; ovipositor sheath black.

Type locality.—Colombia.

Type.—U.S.N.M. No. 13190.

The type and only specimen seen by Ashmead bears no other data.

A second female from Bogota is somewhat larger than the type and has the propodeum more distinctly striate posteriorly and a slight indication of the apical carina medially. A male, also from Bogota, differs from the type virtually only sexually.

Genus EPIMECOIDEUS Ashmead

Epimecoideus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 52, 1900. (Genotype, *E. apicalis* Ashmead, monobasic.)

I have already discussed this genus,³ indicating its close relationship and possible synonymy with *Neotheronia* Krieger, while Townes⁴ goes even farther and synonymizes both *Epimecoideus* and *Neotheronia* with *Theronia* Holmgren.

EPIMECOIDEUS APICALIS Ashmead

Female.—Length 14 mm., antenna 13 mm., sheath 3 mm.

Very slender; body entirely polished and unsculptured.

Head thin, temples nearly flat and very strongly sloping; malar space very short.

³ Proc. U. S. Nat. Mus., vol. 58, p. 44, 1920.

⁴ Ann. Ent. Soc. Amer., vol. 33, p. 289, 1940.

Thorax rather strongly compressed; notaulices deep but very short; scutellum low, margined to middle; propodeum with very strong apical carina but without trace of basal carina; wings broad; legs relatively long and slender, hind femur nearly reaching apex of abdomen. Abdomen very slender, tergite 1 four times as long as broad at apex and with sides nearly parallel, tergite 2 more than twice as long as broad at base; ovipositor and sheath slender.

Entirely bright ferruginous except for black antennae, hind tarsus, apex of middle tarsus, and the sheath; wings brassy hyaline with brilliant reflections, front wing broadly infumate apically, hind wing narrowly so.

Type locality.—Ecuador.

Type.—U.S.N.M. No. 22171.

A single female.

Genus ZONOPIMPLA Ashmead

Zonopimpla ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 55, 1900. (Genotype, *Z. albicincta* Ashmead, monobasic.)

The only specimen bearing the name label "*Zonopimpla albicincta* Ashm." is from Peru, not Africa as indicated in the original description. It agrees with the description in all but the metathoracic character of the second couplet under 11. The statement "metathorax areolated" should read *metathorax not areolated*, for in neither of the genera to which it applies is the propodeum at all areolated.

The type of the genotype lacks the head and the prothorax. It is a polished, unsculptured, and highly ornamented *Epiurus*, representative of an apparently rather large group in the Neotropical region. The group bears the same relation to the Holarctic section of *Epiurus* as does the Neotropical section of *Calliephialtes* to the Holarctic section. It exhibits much the same variation in abdominal, tarsal, and ovipositor structure as that of the Holarctic section.

Enderlein's proposed genotype of *Zonopimpla*, *Z. ashmeadi* Enderlein, appears to be a *Calliephialtes* on account of the long ovipositor. Many species of *Calliephialtes*, including the genotype, have the second tergite in the female no longer than broad, which is the only character in Ashmead's key separating *Zonopimpla* and *Calliephialtes*.

(*Zonopimpla* Ashmead) = *Epiurus* Foerster. New synonymy.

(*Zonopimpla* Enderlein, not Ashmead, genotype *Z. ashmeadi* Enderlein) = *Calliephialtes* Ashmead. New synonymy.

(*Zonopimpla ashmeadi* Enderlein) = *Calliephialtes ashmeadi* (Enderlein). New combination.

EPIURUS ALBICINCTUS (Ashmead), new combination

Zonopimpla albicincta Ashmead, Proc. U. S. Nat. Mus., vol. 23, p. 55, 1900.

Female.—Length (estimated) 8 mm., ovipositor sheath 4 mm.

Entire body polished and unsculptured and sparsely hairy.

Head and prothorax missing.

Thorax rather elongate, sutures and foveae shallow; legs rather stout, especially the tarsi, the apical joints of which are broadly depressed with stout, sharply bent claws.

Abdomen elongate fusiform; carinae of tergite 1 obsolete; tergites 2-5 with impressions deep and tubercles prominent; ovipositor slender, subsagittate at apex, sheath with fine, short hair.

Thorax ferruginous; metapleuron and propodeum black and white, the white apical and lateral on propodeum and dorsal on metapleuron; middle leg luteous, femur with a brown streak dorsally, tibia dorsally and tarsus blackish; hind leg black, coxa dorsally and ventrally and trochanter white; wings hyaline, venation dark; abdomen black, each tergite broadly margined apically and laterally with white, tergites 2-6 with black spots on apical margins near lateral angles; sheath black.

Type locality.—Pinches and Perene Vs., Peru, 2,000-3,000 ft.

Type.—U. S. N. M. No. 56286.

One specimen received from the Geographical Society of Lima.

Genus ERYTHROPIMPLA Ashmead

The type specimen of the genotype is in the collection of the National Museum. It is badly broken, but most of the broken-off parts are glued to a card, so the specimen is still complete except for the antennae and the ovipositor sheath.

This genus, together with the Australian *Camptotypus* Kriechbaumer and the Oriental *Trichiothecus* Cameron, have been synonymized with the Ethiopian *Hemipimpla* Saussure. The first three are doubtless synonymous, *Camptotypus* having priority, but, judging from the few species available to me, *Hemipimpla* may be distinct. The conspicuously fasciate wings of *Hemipimpla* together with the shorter ovipositor give a quite different impression from that of *Camptotypus* with its yellow, black, or apically black wings and longer ovipositor. In addition, *Hemipimpla* has the malar space shorter, the ocelli larger, the notaulices deeper with prescutum more convex, the dorsal carinae of tergite 1 much weaker and that segment more densely sculptured, the basal abscissa of radius virtually as long as the apical abscissa, and the long sides of the areolet parallel, whereas the opposite of each of these characteristics usually pertains in *Camptotypus*. I therefore prefer to use *Camptotypus* for the Oriental and Australian species and restrict *Hemipimpla* to the Ethiopian species.

Genus CAMPTOTYPUS Kriechbaumer

Camptotypus KRIECHBAUMER, Ent. Nachr., vol. 15, p. 311, 1889. (Genotype, *C. sellatus* Kriechbaumer, monobasic.)

Erythropimpla ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 57, 1900. (Genotype, *E. abbottii* Ashmead, monobasic.)

Trichiothecus CAMERON, Journ. Straits Branch Roy. Asiatic Soc., vol. 39, p. 138, 1903. (Genotype, *T. ruficeps* Cameron, monobasic.)

CAMPTOTYPUS ABBOTTII (Ashmead), new combination

Erythropimpla abbottii Ashmead, Proc. U. S. Nat. Mus., vol. 23, p. 57, 1900.

Female.—Length 19 mm., ovipositor sheath broken but probably about 15 mm.

Head and thorax polished and virtually unsculptured; head in front view transversely subtriangular; face slightly narrower than frons, weakly impressed on each side of middle; clypeus nearly flat; semicircularly emarginate; malar space two-thirds as long as basal width of mandible; temples flat, narrow, strongly receding; diameter of lateral ocellus hardly as long as postocellar line; occipital carina obsolescent.

Thorax deeper than broad; epomia absent; notaulices very weak; prepectoral carina obsolescent; mesopleural furrow and fovea virtually wanting; scutellar frenum unsculptured, postscutellar frenum very weakly foveolate; furrows and carinae separating propodeum and upper and lower divisions of metapleuron entirely effaced, propodeum with scattered, shallow punctures. Legs rather stout and short; apical tarsal joints very broad, depressed, claws large, sharply bent, basal teeth large. Wings broad; apical abscissa of radius distinctly longer than basal abscissa and forming a rather strongly sigmoid curve; areolet nearly twice as long as broad, narrowed toward apex; intercubittella long, strongly oblique and strongly recurved at upper end, the two abscissae of radiella equal; nervellus broken at nearly a right angle at about lower third.

Abdomen broader than thorax, with deep furrows setting off strongly convex median areas and tumid apical margins; first tergite nearly without sculpture, dorsal carinae very strong, especially at summit; tergites 2-5 with furrows foveolate and each with a median, triangular, coarsely punctate area; tergite 6 without furrows and more finally and extensively punctate; last two tergites polished.

Ferruginous with only flagellum and ovipositor sheath black; wings yellowish hyaline with faintly infumate apical margins.

Type locality.—Trong, Lower Siam.

Type.—U. S. N. M. No. 56290.

The type was taken by Dr. W. L. Abbott. A second specimen, only 12 mm. in length, is labeled "Peninsula Siam, Nakon Sri Tamarat, Khad Ram, 1200 ft." It was taken Feb. 26, 1922, by H. M. Pendlebury.

The genotypes of the following genera have been described subsequent to their original publication, identified by synonymy with other species, or have not been found:

Genus **CHROMOCRYPTUS** Ashmead

Chromocryptus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 41, 1900. (Genotype, *C. albopictus* Ashmead.)

I have already⁵ published a description and the synonymy of this genus and of its genotype⁶ and synonymized the genotype with *Chromocryptus planosae* (Fitch).

Genus **NEOPIMPLA** Ashmead

Neopimpla ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 53, 1900. (Genotype, *N. abbottii* Ashmead.)

I have been unable to find the type or any other specimen of this species.

Genus **LEPTOBATOPSIS** Ashmead

Leptobatopsis ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 47, 1900. (Genotype, *L. australiensis* Ashmead.)

I have already discussed this genus⁷ and later⁸ synonymized the genotype with *Leptobatopsis indicus* (Cameron) and have given the synonymy of the genus.

Genus **EUCTENOPUS** Ashmead

Euctenopus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 50, 1900. (Genotype, [*E. zealandicus* Ashmead]=*E. novazealandicus* Ashmead.)

It should be noted that the first publication of this genus was in the Proceedings of the Linnaean Society of New South Wales, which is dated June 27, 1900, whereas the Classification of the Ichneumon Flies did not appear until October 13, 1900. Also, the genotype was originally described as *E. novazealandicus*. The genus is very closely allied to *Phytodietus*, from which it differs, in addition to the venational characters given by Ashmead, in its lack of the prepectoral carina and its more distinctly defined notaulices. The malar space is not effaced, as stated by Ashmead, but is fully a third as long as the basal width of the mandible.

⁵ Proc. U. S. Nat. Mus., vol. 53, p. 254, 1920.

⁶ Jour. Washington Acad. Sci., vol. 15, p. 389, 1925.

⁷ Philippine Journ. Sci., vol. 20, p. 591, 1922.

⁸ Ins. Matsumurana, vol. 8, p. 17, 1933.

Genus *TREVORIA* Ashmead

Trevoria ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 50, 1900. (Genotype, *T. yukatatensis* [sic] *yakutatensis* Ashmead.)

The genotype was later described by Ashmead⁹ himself. It is represented only by the type male from Yakutat, Alaska. The misspelling of the specific name, which led Dalla Torre to record the species as from Yucatan, was corrected in the second reference. The genus appears to be most closely related to *Cryptopimpla* Taschenberg, differing principally in the lack of the apical carina of the propodeum. The pentagonal areolet is only an exaggeration of a condition that sometimes occurs in *Cryptopimpla*.

Genus *PIMPLOPTERUS* Ashmead

Pimplopterus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 52, 1900. (Genotype, *P. alaskensis* Ashmead.)

The genotype was redescribed by Ashmead.¹⁰ It is a *Lissonota* very closely allied to, and perhaps synonymous with, *frigida* (Cresson), the most obvious difference being the largely black trochanters of *alaskensis*.

(*Pimplopterus* Ashmead) = *Lissonota* Gravenhorst. New synonymy.

(*Pimplopterus alaskensis* Ashmead) = *Lissonota alaskensis* (Ashmead). New combination.

The above new combination renders *Lissonota alaskensis* Ashmead (1902) a secondary homonym, which is disposed of as follows:

(*Lissonota alaskensis* Ashmead, 1902, not [*Pimplopterus*] *Lissonota alaskensis* [Ashmead], 1900) = *Lissonota sakala*, new name.

Genus *HARRIMANIELLA* Ashmead

Harrimaniella ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 52, 1900. (Genotype, *H. yukakensis* [sic] *kukakensis* Ashmead.)

The genotype was redescribed by Ashmead¹¹ with the spelling of the specific name, derived from the type locality, Kukak Bay, Alaska, corrected.

In my opinion the genus is not distinct from *Lissonota*.

(*Harrimaniella* Ashmead) = *Lissonota* Gravenhorst. New synonymy.

(*Harrimaniella kukakensis* Ashmead) = *Lissonota kukakensis* Ashmead. New combination.

⁹ Proc. Washington Acad. Sci., vol. 4, p. 196, 1902.

¹⁰ Idem.

¹¹ Ibid., p. 198.

Genus ALLOTHERONIA Ashmead

Allotheronia ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 55, 1900. (Genotype, *A. 12-guttata* Ashmead.)

Townes¹² has synonymized the genus with *Echthromorpha* Holmgren and the genotype with *E. intricatoria* (Fabricius).

Genus GLYPTOGASTRA Ashmead

Glyptogastra ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 57, 1900. (Genotype, *G. hawaiiensis* Ashmead.)

Ashmead later¹³ gave a formal description of the genotype; and Townes¹⁴ has synonymized the genus with *Echthromorpha* Holmgren.

Genus POLYSPHINCTOMORPHA Ashmead

Polysphinctomorpha ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 59, 1900. (Genotype, *P. luggeri* Ashmead.)

I have transferred this genus to the subtribe Thymaridina, synonymized it with *Neliopisthus* Thomson, and redescribed the type species.¹⁵

Genus PLEURONEUROPHION Ashmead

Pleuroneurophion ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 86, 1900. (Genotype, *P. hawaiiensis* Ashmead.)

Ashmead redescribed and figured the genotype in Fauna Hawaiiensis, vol. 1, pt. 3, p. 342, pl. 9, fig. 1, 1901.

Genus ATHYREODON Ashmead

Athyreodon ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 87, 1900. (Genotype, *A. thoracicus* Ashmead.)

Hooker¹⁶ has recharacterized the genus and synonymized the genotype with *Athyreodon atriventris* (Cresson). He failed, however, to indicate the type locality, Ecuador, or to include it in the distribution of the species.

Genus BANCHOGASTRA Ashmead

Banchogastra ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 87, 1900. (Genotype, *B. nigra* Ashmead.)

Ashmead¹⁷ redescribed and figured the genotype.

¹² Ann. Ent. Soc. Amer., vol. 33, p. 288, footnote, 1940.

¹³ Fauna Hawaiiensis, vol. 1, pt. 3, p. 388, 1901.

¹⁴ Ann. Ent. Soc. Amer., vol. 33, p. 288, footnote, 1940.

¹⁵ Proc. U. S. Nat. Mus., vol. 56, pp. 378, 380, 1919.

¹⁶ Trans. Amer. Ent. Soc., vol. 38, pp. 100, 102, 1912.

¹⁷ Fauna Hawaiiensis, vol. 1, pt. 3, p. 343, pl. 9, fig. 8, 1901.

Genus PYCNOPHION Ashmead

Pycnophion ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 87, 1900. (Genotype, *P. molokaiensis* Ashmead.)

Ashmead¹⁸ redescribed and figured the genotype.

Genus OPHELTOIDEUS Ashmead

Opheltoideus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, p. 95, 1900. (Genotype, *O. johnsoni* Ashmead.)

No specimen of the genotype has ever been found, but Bradley¹⁹ synonymized the genus with *Parabates* Foerster. Townes²⁰ suggests a possible relationship of the genotype to *Hadrodactylus longicornis* (Cresson). The generic description is entirely inadequate as a basis for any speculation as to its identity.

¹⁸ Ibid., p. 343, pl. 9, fig. 3.

¹⁹ Ann. Mag. Nat. Hist., ser. 9, vol. 3, p. 324, 1919.

²⁰ Lloydia, vol. 1, p. 173, 1938.

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NEW NEOTROPICAL INSECTS OF THE APTERYGOTAN FAMILY JAPYGIDAE

By H. E. EWING and IRVING FOX

THE new species of Japygidae described in this paper represent those found while the writers were working up the exotic material in the collection of the United States National Museum. Most of this material was in good condition, and the descriptions here given were made almost exclusively from mounted specimens stained with acid fuchsin. In addition to the usual taxonomic treatment, notes have been added on the nature of food taken (victims eaten) by these predators, and in the case of one species a description is given of the musculature of the proximal part of the antenna.

All the species here described have in common a type of antenna peculiar to certain genera. It is described as follows: Antenna long, extending backward over much of the thorax and composed of a large and individually varying number of segments; segment IV broadest, with each succeeding segment progressively reduced in diameter; setae of each segment of varying length. Also in each species the legs are progressively longer from the first to the last. However, leg II may be but very slightly longer than leg I, while leg III may be much longer than II. Like most tropical japygids, those here described are from moderate to large size.

EVALLJAPYX DURICAUDA, new species

PLATE 33, FIGURE 1

Description.—Head with lateral margins almost straight for most of their length but strongly curved near base. Antenna consisting of

22 segments; segment I longer than broad; segment II shorter than I and with axis slightly outcurved; segment III slightly longer than II and broadest near distal margin. Antenna with setae on the more distal segments partly arranged in two or three transverse rows. Distal tooth of mandible much larger than the other three, which graduate in length, the most nearly medial being the smallest. Outer lamina of inner lobe of maxilla not pectinate, slender and curved, the other laminae pectinate.

Pronotum well supplied with setae of varying lengths. Mesonotum divided near its anterior end by a curved transverse suture in front of which are five setae, two being large and robust; the remainder of the mesonotum and the metanotum richly beset with setae of varying lengths. Tarsi each terminated by two subequal lateral claws and a vestigial median claw.

Abdomen with first six terga subequal; each with a transverse line near its anterior end, in front of which are a variable number of small setae. Sterna richly provided with small setae. Subcoxal organs of segment I each bearing a row of five subequal long setae and a number of hairlike microsetae. Styli similar, subequal, each with a subbasal small seta. Segment VII not so broad as VI, much more heavily sclerotized but with fewer setae. Segment VIII narrower than VII, more than twice as long as IX. Chaetotaxy of segment X and chaetotaxy and dental armature of forceps as shown in plate 33, figure 1.

Length of body, including forceps, 7.0 mm.; width (that of segment III of abdomen), 0.6 mm.

Type locality.—San José de Pinula, Guatemala.

Type (holotype).—U.S.N.M. No. 55213.

Remarks.—Description based on a single adult specimen taken at the type locality in May 1924 by Wm. M. Mann.

This species is similar to *E. bruneri* Silvestri but may be readily separated from it by the dental armature of the forceps and by the number of antennal segments.

EVALLJAPYX MANNI, new species

PLATE 33, FIGURE 3

Description.—Head with lateral margins almost straight for most of their length but strongly curved near base. Antenna long, number of segments 32; segment I longer than broad; segment II shorter than I and with axis slightly outcurved; segment III about as long as II and broadest near distal margin. All antennal segments well clothed with hairlike setae, those on the more distal segments arranged in several irregular rows. Distal tooth of mandible much larger than the other three; two proximal teeth united at base and

together forming a broad curved tooth. Outer lamina of inner lobe of maxilla not pectinate, long and slender, the other laminae pectinate.

Pronotum well supplied with setae of varying lengths. Mesonotum divided near its anterior end by a curved transverse suture in front of which is a single pair of setae, the remainder of the mesonotum and the metanotum richly beset with setae of varying lengths. Tarsi each terminated by two subequal lateral claws and a vestigial median claw.

Abdomen with first six terga and sterna essentially as in the previously described species. Subcoxal organs of segment I each with a row of about 30 setae. Abdominal segments VII, VIII, and IX as in the previously described species. Chaetotaxy of segment X and chaetotaxy and dental armature of forceps as shown in figure 3.

Length of body, including forceps, about 11 mm.; width (that of segment III of abdomen), 1.3 mm.

Type locality.—Estrella Valley, Costa Rica.

Type (holotype).—U.S.N.M. No. 55214.

Remarks.—Description based on a single adult taken at type locality, April 1924, by Wm. M. Mann.

This species superficially resembles *E. crassicauda* Silvestri, from which it may be readily distinguished by the dental armature of the forceps.

CATAJAPYX NEOTROPICALIS, new species

PLATE 33, FIGURE 2

Description.—Head with lateral margins strongly curved. Antenna consisting of 30 segments; segment I broader than long; segment II longer than I and strongly outcurved; segment III about as long as II and broadest near distal margin. Setae of antenna on the more distal segments partially arranged in one or two rows per segment. Mandible possessing five teeth, the distal larger than the others, the proximal smallest and broadest, almost triangular. Outer lamina of inner lobe of maxilla not pectinate but armed distally with two to several processes, other laminae pectinate.

Pronotum with a well-developed median apodeme and well supplied with setae of varying lengths. Mesonota and metanota also richly provided with setae. Tarsi each terminated by two unequal lateral claws and a small, slender, acuminate, weakly sclerotized, median claw.

Abdominal terga I through VI subequal, well supplied with setae, abdominal segment VII wider than VI and more heavily sclerotized; segment VIII not so broad as VII, less than twice as long as IX. Abdominal sternum I with a broad area of what seem to be sense setae on each side. Subcoxal organ not sufficiently distinct in the

specimens available to be described. Styli long, each with a subbasal seta which is long and curved. Forceps somewhat variable in dental armature, those of the holotype illustrated in figure 2.

Length of body, including forceps, about 7 mm.; width (that of segment III of abdomen), 0.7 mm.

Type locality.—Barro Colorado Island, Panama.

Type (holotype).—U.S.N.M. No. 55215.

Remarks.—Description based on the following four specimens: One adult (holotype) taken July 19, 1938, by E. C. Williams at the type locality; one adult (paratype) taken at Porto Bello, Panama, by E. A. Schwarz; one adult (paratype) taken at Bobas, Guatemala, in May by W. M. Mann; one adult (paratype) taken at Navarro, Costa Rica, in March by W. M. Mann.

METAJAPYX SCHWARZI, new species

PLATE 34, FIGURE 4

Description.—Head with lateral margins strongly curved posteriorly. Antenna with 36 to 38 segments; segment I considerably broader than long; segment II longer than I and with axis strongly outcurved; segment III as long as II and slightly broader, with straight axis. The antennal setae on the more distal segments partly arranged in two or three transverse rows. Each mandible bearing four teeth, the most distal of which is larger than the three others, which are subequal. Outer lamina of inner lobe of maxilla long, curved, and without teeth, other laminae strongly curved, flattened, and pectinate.

Pronotum but slightly longer than broad, bearing about 24 setae, two pairs of which are situated near middle of lateral margins. Mesonotum divided near its anterior end by a curved transverse suture, in front of which is situated a single pair of straight, submedian setae. Metanotum similar to mesonotum but slightly longer and broader. Tarsi each terminated by two unequal, lateral claws and a vestigial median claw.

Abdomen with first seven terga subequal; each with a transverse line near its anterior end, in front of which there are no setae and each divided also by a hyaline, median groove. Sterna II to VII likewise each with a transverse line near its anterior end, but without the median groove. Subcoxal organs of segment I each bearing a row of small, short, subequal setae and median glandular organ of same segment with a large number of circular, dome-shaped, unequal, contiguous disculi. Styli similar, subequal, each without subbasal spur but with a single seta which is curved and ventrolateral. Segments VIII and IX shorter than the others and each strongly bilobed anterolaterally. Segment IX much shorter than VIII and with a single pair of curved lateral setae and a dorsal, posterior, marginal row of

six microsetae. Segment X dorsally forming a square and bearing several conspicuous, curved setae. Right arm of forceps much broader toward its base than left arm, but distally narrower and more strongly curved; proximal half of right arm with four teeth, the first three of which are subequal and smaller than the fourth, and all of which are hyaline apically; distal half of right arm with five or six very low vestiges of teeth. Left arm of forceps slender throughout, basal three-fourths with a row of very low, flat, subequal teeth, and distal to them a large tooth with a hyaline apex.

Length of body, including forceps, 8.0 mm.; width (that of segment III of abdomen), 0.9 mm.

Type locality.—Livingston, Guatemala.

Type (holotype).—U.S.N.M. No. 55216.

Remarks.—Description based on the following: One adult (holotype) taken October 5, 1905, by E. A. Schwarz and H. S. Barber and two adults taken at Lombardia, Honduras, 1924, by W. M. Mann.

In the rectum of the holotype specimen are the remains of some small pterygotan insect. According to W. H. Anderson, of the Bureau of Entomology and Plant Quarantine, they probably represent those of a coleopterous larva of the family Staphylinidae.

The genus *Metajapyx* is not well differentiated from *Japyx*, since the species of the two intergrade. Further study may lead to its suppression.

MIXOJAPYX COOKI, new species

PLATE 34, FIGURES 5, 6

Description.—Head with lateral margins almost straight for most of their length but strongly curved near base. Antenna very long, number of segments 44 or 45; segment I broader than long; segment II slightly longer than I and with axis slightly outcurved; segment III as long as II and broadest near distal margin. All antennal segments well clothed with hairlike setae which do not form rows; as the size of the segments becomes smaller, their setae likewise become finer and shorter. Distal tooth of mandible much larger than the other three; two proximal teeth united at base and together forming a lobe, demarcated by a suture from the remaining part of the mandible. Outer lamina of inner lobe of maxilla pectinate and similar to the other laminae.

Pronotum with a well-developed median apodeme and well supplied with setae of varying lengths. Mesonotum with the distinct, movable prescutum typical of the genus. The latter bears over 50 setae of varying sizes and lengths. Scutum with sublateral apodemes straight and slightly converging posteriorly. Metanotum similar to mesonotum but slightly larger and not so well sclerotized. Thoracic spiracles

large, conspicuous. Tarsi each terminated by two unequal, lateral claws and a vestigial median claw. Each lateral claw bears a poorly formed basal tooth, not easily seen in some of the tarsi.

Abdomen with terga II to VI subequal, each having a hyaline median groove and a transverse line near its anterior end, in front of which are a few microsetae but no setae. Segment VII of abdomen broader than VI, more heavily sclerotized and with posterior angular lobes more conspicuous; segment VIII not so broad as VII but better sclerotized, segment IX of usual shape, and X longer than broad and with lateral margins almost straight. Forceps heavily pigmented and sclerotized; basal three-fifths of left arm provided with two rows of five or six irregularly placed teeth. For other characters of forceps see figure 6. Subcoxal organs of segment I each with a fringe of short, subequal setae, behind which is a row of sensory pits; median glandular organ (pl. 34, fig. 5) large, conspicuous, with convex posterior margin and over 100 spherical, tuberclelike disculi, many of which are contiguous. Styli each with curved ventrolateral seta and some with a poorly developed basal spur.

Length of body, including forceps, 24.0 mm.; width (that of segment III of abdomen), 3.2 mm.

Type locality.—"Tactic, St. Rosa," Guatemala.

Type (holotype).—U.S.N.M. No. 55217.

Remarks.—Description based on three adults taken at type locality, June 1904, by O. F. Cook. In the rectum of one of these specimens are the undigested remains of an insect which W. H. Anderson identified as some coleopterous larva, probably a species of Carabidae.

MIXOJAPYX BARBERI, new species

PLATE 34, FIGURES 7, 8

Description.—Head with lateral margins moderately outcurved. Antenna of moderate length, number of segments 40 to 46, but usually 42; segment I broader than long; segment II slightly longer than I and with axis very slightly outcurved; segment III about as long as II and broadest apically; segment IV subequal to III but with posterior margin distinctly curved. All antennal segments well clothed with thin setae of varying lengths which do not form rows. Distal tooth of mandible much the largest of the four; two proximal teeth united at base forming a lobe, demarcated from the remaining part of mandible. Outer lamina of inner lobe of maxilla long, slender, curved, without teeth.

Pronotum with a well-developed median apodeme and well supplied with setae of varying lengths, some being but little larger than microsetae. Mesonotum with the typically distinct, movable prescu-

tum, the latter bearing many setae of varying lengths. Metanotum similar to mesonotum but slightly larger. All four pairs of thoracic spiracles present, but only the first pair large and conspicuous. Tarsi each terminated by two slightly unequal lateral claws and a minute median claw, which is easily overlooked.

Abdomen with terga II to VII subequal, each having a hyaline median groove and a transverse line near its anterior end, in front of which are a few microsetae. Segment VII of abdomen equal in width to VI but more heavily sclerotized and with more conspicuous posterior angular lobes; segment VIII not so broad as VII but more heavily sclerotized; segment IX of usual shape and X dorsally about as broad as long. Subcoxal organs of segment I each with a fringe of short, subequal setae, but with no microsetae; median gland large and possessing many disculi (pl. 34, fig. 7) which are unusual in that they are angulate instead of circular and so completely contiguous that they occupy all the surface of the gland. Styli each with a poorly developed basal spur and a single, conspicuous, curved seta. Forceps heavily pigmented and sclerotized; basal three-fifths of left arm provided with two rows of similar teeth, the lower of which is not seen from above and hence not shown in figure 8.

Length of body, including forceps, 12.3 mm.; width (that of segment III of abdomen), 1.7 mm.

Type locality.—Cacao, Guatemala.

Type (holotype).—U.S.N.M. No. 55218.

Remarks.—Material at hand as follows: Three specimens from type locality, March 1906, by E. A. Schwarz and H. S. Barber; three specimens (two young) from type locality, March 25, 1906, same collectors; three specimens, "Cacao, Trece Aguas, Alta Verapaz, Guatemala IV," March 27–29, 1906, same collectors; one specimen from type locality April 1906, same collectors; one specimen from Purulha, Guatemala, May 5, 1906, "D. F. C."

Three of these Guatemalan japygids have chitinous remains of arthropods in the alimentary canal. In the rectum of the single specimen taken at Purulha is the head of a dipterous insect, which probably is that of a fungous gnat (Mycetophilidae) according to A. Stone, of the Bureau of Entomology and Plant Quarantine. In the rectum of an adult specimen taken at Cacao, March 27–29, 1906, are the remains of some very small, heavily sclerotized insect, the largest piece of which appears to be a part of the thorax of a beetle. In another specimen, taken at Cacao, March 1906, there are the remains of two arthropods in the alimentary canal. In the anterior part of the canal, scattered along in the thoracic part, are the legs and the cephalothorax of a beetle mite (Oribatoidea) while in the rectum are the remains of an insect one piece of which is the last tarsal segment of a leg with two equal claws and a pulvillus.

NEOJAPYX TROPICALIS, new species

PLATE 34, FIGURES 9, 10

Description.—Head with lateral margins almost straight and parallel. Antenna somewhat more than twice as long as head, number of segments 34 to 36; segment I about twice as broad as long; segment II with axis moderately outcurved; segment III slightly shorter than IV and not so broad. All antennal segments well provided with straight, or almost straight, setae which do not form rows. Mandible with distal tooth long, curved, sharp.

Pronotum with well-developed median apodeme and well supplied with setae of varying lengths. Mesonotum with a large, distinct, movable prescutum, the latter bearing several setae including a conspicuous pair of stout, straight, submedian setae situated at the junction of the median apodeme with the posterior, marginal apodemè. Metanotum larger than mesonotum and not so strongly sclerotized; prescutum without median apodeme and with a pair of stout, straight, submedian setae situated farther from posterior margin. First three pairs of thoracic spiracles visible; the other pair may be present but not detectable in the unstained specimen at hand. Tarsi each terminated by two very unequal, lateral claws and a minute median claw. Each lateral claw bears a somewhat indistinct basal tooth.

Abdomen with terga II to VI subequal, each having a transverse line near its anterior end, in front of which there appear to be no setae. Segment VII of abdomen intermediate in width between VI and VIII; segment VIII with sides almost parallel and bearing several conspicuous setae near posterior border; segment IX of the usual shape and bearing dorsally several small to minute setae. Subcoxal organs of segment I each with a fringe of subequal setae which are not arranged in a definite row. Styli each with a poorly developed basal spur and a single curved seta. Forceps equal except that the left arm has two rows of teeth on the basal part, four teeth being in the upper and three in the lower row. For the other characters of the forceps see figure 10.

Length of body, including forceps, 7.6 mm.; width (that of segment III of abdomen), 0.8 mm.

Type locality.—Georgetown, British Guiana. "Quarantine at Philadelphia, Pa., on soil of potted palm."

Type (holotype).—U.S.N.M. No. 55219.

Remarks.—Description based on the holotype, the only specimen at hand, which was taken in June 1921, through the Government quarantine service.

The alimentary canal of the single specimen of this species is filled for most of its length with partially digested food material. In the

region of the eighth abdominal segment can be clearly detected the chelicerae and some other parts of a mite of the family Parasitidae.

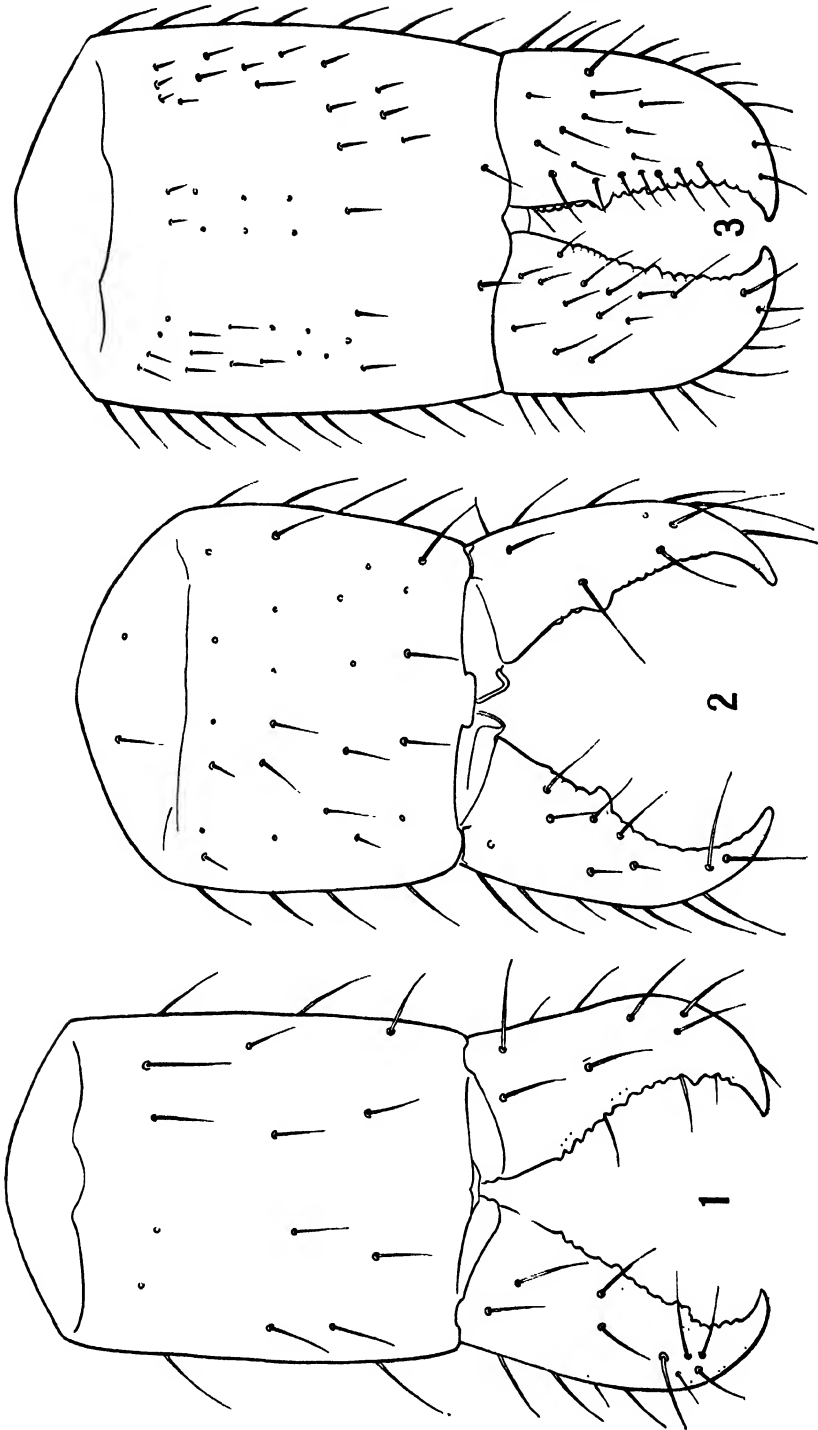
The single specimen of *N. tropicalis* is of further interest because it has been prepared in such a way as to exhibit the musculature. Advantage is taken of this fact to record some observations on the muscles of the proximal part of the antenna. These notes supplement the descriptions and figure of the same part of the antenna of a species of *Japyx* already given by Imms.¹ In general the number and arrangement of the muscles (pl. 34, fig. 9) are the same as reported by Imms for *Japyx*, but the following should be noted:

Segments II and III appear to be articulated firmly in the manner of a hinge, there being an exceedingly short articulating membrane between the two. This condition prevents III being telescoped into II, and restricts the movement between the two segments to a single plane, which in this instance is vertical. Imms describes two muscles for segment II, a levator and a depressor. In the case of *N. tropicalis* it is not clear whether there is a single muscle with two heads or two distinct muscles as shown by Imms.

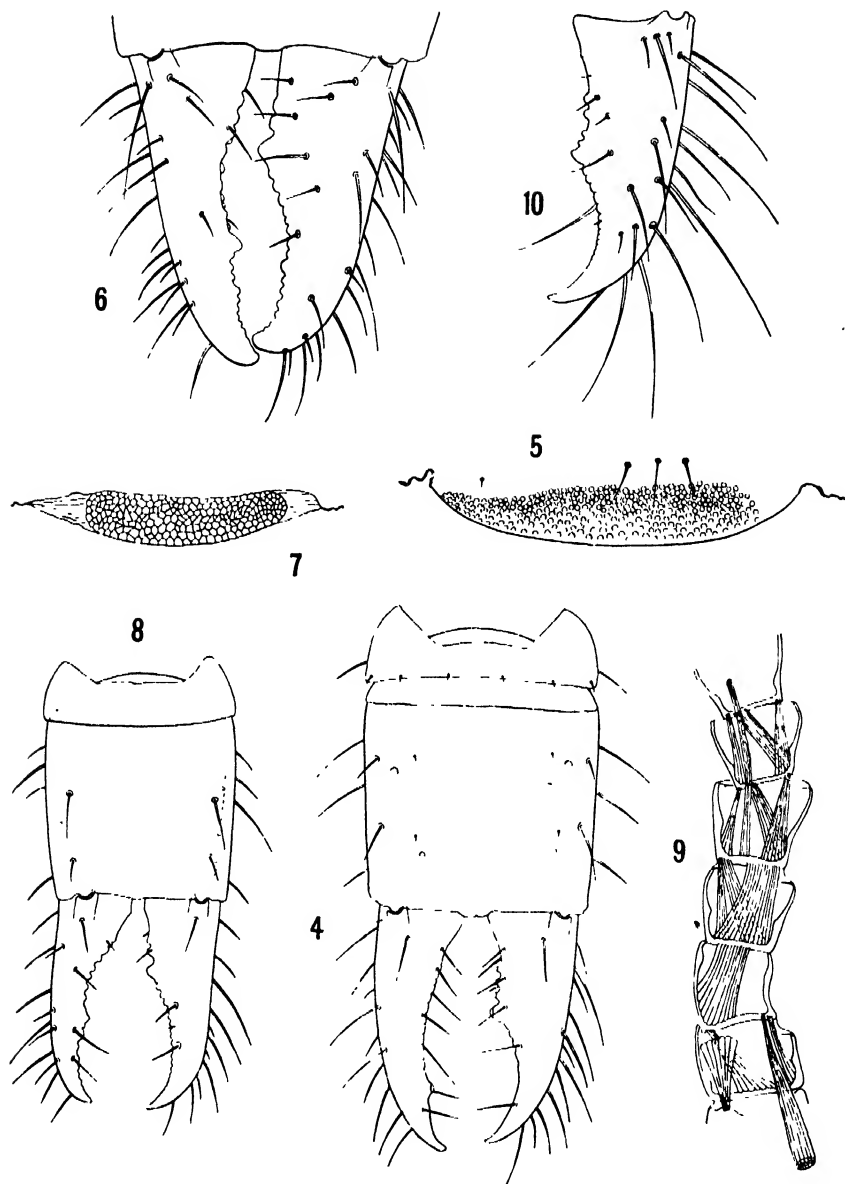
An examination of the structures illustrated in plate 34, figure 9 indicates rather conclusively that this large muscle in segment II is the same as the large, diagonal levator of III, which in turn must be the same as the smaller and less diagonal levator of IV, which is undoubtedly the same as the longitudinal levator muscle found in each succeeding segment. Thus this same muscle, found in the segments beyond the first, retains almost without change its place of insertion and its function, while its origin shifts from the anterobasal to the posterobasal region of the segment in which it occurs.

In segment I there is a very interesting muscle, since its origin is from almost a single point, while it is spread out like a fan at its place of insertion. Concerning it Imms states, "The functions of this muscle are not wholly clear." In *Japyx*, according to Imms, "some of its fibres are inserted onto the base of segment II * * *." He also states that the origin of the muscle is on the border of the scape. In *N. tropicalis* the insertion of this muscle is entirely on the anterodorsal aspect of segment I and its origin from the sclerotized and elevated ring of the head capsule to which the base of the antenna is articulated. Its function in the case of this species is clear, i. e., it retracts and turns inward segment I.

¹ Quart. Journ. Micros. Soc., vol 81, pt. 2, p. 280, 1939.



1. *Ewalljapyx duricauda*, new species, abdominal segment X and forceps, dorsal view; 2. *Catajapyx neotropicalis*, new species, abdominal segment X and forceps, dorsal view; 3. *Ewalljapyx manni*, new species, abdominal segment X and forceps, ventral view.



- 4, *Metajapyx schwarzi*, new species, segments IX and X of abdomen with forceps, from above; 5, *Mixojapyx cooki*, new species, median glandular organ, from below; 6, *Mixojapyx cooki*, new species, forceps, from above; 7, *Mixojapyx barberi*, new species, median glandular organ, from below; 8, *Mixojapyx barberi*, new species, segments IX and X of abdomen with forceps; 9, *Neojapyx tropicalis*, new species, proximal portion of left antenna showing muscles, dorsal view; 10, *Neojapyx tropicalis*, new species, right arm of forceps, dorsal view.



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THE FRESH-WATER FISHES OF LIBERIA

By LEONARD P. SCHULTZ

INTRODUCTION

This report on the fresh-water fishes of Liberia is based mostly on the excellent collection made by Dr. William M. Mann, director of the National Zoological Park, Washington, D. C., while he was directing the Smithsonian-Firestone Expedition to Liberia in 1940.¹ This collection was supplemented by others in the United States National Museum and by a small collection lent by the Museum of Comparative Zoology,² through the courtesy of Dr. Thomas Barbour and W. C. Schroeder.

One new cyprinid genus, *Mannichthys*, six new species, and one new subspecies are described, as follows:

Characnidae:

Nannocharax seiboldi

Cyprinidae:

Barilius silex

Mannichthys lucileae

Barbus fionot

Barbus boboi

Siluridae:

Paramphilius firestonei

Cyprinodontidae:

Micropanchax macrurus manni

Although Dr. Mann was in Liberia for the purpose of obtaining animals for the National Zoological Park at Washington, D. C., he found time to collect over 2,400 specimens of fishes from three river systems. This collection of fresh-water fishes is one of the best ever

¹ Mann, W. M. and Mann, L. Q., Collecting live animals in Liberia. Explor. Field-Work Smithsonian Inst. 1940, pp. 13-20, 10 figs., 1941.

² Most of these fishes were collected by Dr. Glover M. Allen while he was with the Harvard African Expedition, 1926-1927, reported upon in "The African Republic of Liberia and the Belgian Congo," edited by Richard P. Strong, vols. 1 and 2, 1064 pp., Harvard University Press, 1930.

made in Liberia. In addition to 15 species never before recorded in the Liberian fauna, 72 new distribution records for that country were obtained.

Dr. Mann's collection at Bendaja, in the Mano River drainage, represents the first fishes to be reported upon from that stream. He took 22 species, none of them new.

In the St. Pauls River system Dr. Mann collected fishes at Bromley and at Belllyella. The latter locality, near the Tuma River, is far up the St. Pauls River system, and there 13 species were obtained. One was a new species found nowhere else; another was a new species found also at Bromley. Two others were new records for the St. Pauls River system but were collected also at Bromley. At Bromley 28 species were collected, 15 of which have not been reported previously from the St. Pauls River, and 5 of these were new. One of these was taken also at Belllyella.

In the Du and Borlor River systems, 37 species were taken, 20 of which have not previously been recorded from the Du-Borlor-Farmington River system. Among these, 1 was a new species found nowhere else and 3 others were new species but found also in St. Pauls River.

Dr. Mann collected fishes in three river systems, taking altogether 47 species; 18 other species have been reported upon in the literature; and 3 others not previously recorded from Liberia are listed in this report, based on specimens either in the United States National Museum or the Museum of Comparative Zoology. Thus, the known strictly fresh-water fish fauna of Liberia totals 68 species.

A number of fishes have been reported from the brackish waters of Liberia: *Mugil cephalus* by Steindachner,³ from the mouth of Messurado River (one of the mouths of St. Pauls River at Monrovia); *Mugil falcipinnis* by Steindachner,⁴ from "Fischermann See" and "Messurado R."; Boulenger⁵ records it from Nanna Kru.

Steindachner⁶ records *Gerres melanopterus* from St. Pauls River and Cape Mount River, and Hubrecht⁷ records it from the mouth of the Messurado River in brackish water.

Fowler⁸ reports *Ophichthus rufus* (Rafinesque) from Mount Coffee (St. Pauls River). This eel probably migrated from the sea (U. S. N. M. No. 48488).

Steindachner⁹ reported *Belone senegalensis* and *Hemirhamphus schlegelii*¹⁰ from Fischermann See at Buluma.

³ Notes Leyden Mus., vol. 16, p. 33, 1894.

⁴ Ibid., p. 35.

⁵ Cat. fresh-water fishes Africa, vol. 4, p. 89, 1916.

⁶ Notes Leyden Mus., vol. 16, p. 12, 1894.

⁷ Notes Leyden Mus., vol. 3, p. 71, 1881.

⁸ Proc. U. S. Nat. Mus., vol. 56, p. 241, 1919.

⁹ Notes Leyden Mus., vol. 16, p. 73, 1894.

¹⁰ Ibid., p. 74.

Psettus sebae has been reported from the mouth of the Messurado River by Hubrecht¹¹ and by Steindachner.¹² Fowler¹³ records one from Monrovia and Boulenger¹⁴ one from Nanna Kru.

Steindachner reported *Cynoglossus senegalensis*¹⁵ and *Caranx carangus*¹⁶ from the mouth of the Messurado River.

Pristipoma jubelini was reported from the mouth of the Messurado River by Hubrecht¹⁷ and by Boulenger¹⁸ from Nanna Kru.

Pellegrin¹⁹ described a new blind eel, *Typhlosynbranchus boueti*, from near Monrovia.

Dr. Mann's collecting localities can be identified by reference to the information set forth in the following paragraphs, and to the map, figure 37. The distances indicated below were based on a 1938 map of Liberia prepared and printed by the Institute of Geographical Exploration, Harvard University.²⁰

Bendaja, Liberia, is situated about 25 miles inland near the Mano, or Gbea, River. Collections made May 14 to 27, 1940.

Bellyella, Liberia, is in the St. Pauls River drainage, about 100 miles inland from Monrovia; March 23 to 30, 1940.

Bromley is but a few miles above the mouth of St. Pauls River; June 6 to 8, 1940.

Gibi Mountain is between the Farmington River and the Borlor River, about 35 or 40 miles from the mouth of the latter. The fish were taken at about 900 feet elevation; April 10 to 16, 1940.

Harbel, Liberia, is the name of the Firestone Plantation in the district between the lower part of the Du River (= Du Queah-Junk River) and the Borlor-Farmington Rivers; March 10 to July 17, 1940.

Family POLYPTERIDAE

KEY TO THE SPECIES OF POLYPTERUS FROM LIBERIA

- 1a. Scales in front of first dorsal spine 23 to 29 (26 to 29 in my specimens); dorsal V-IX, 16 to 18; anal 12 to 15; scales 52 to 57; 33 to 40 around middle of body (33 to 36 in my specimens); no black spot on base of pectorals, as described by Boulenger-----*Polypterus palmas* Ayres
- 1b. Scales in front of first dorsal spine 30 to 33; dorsal VI to IX, 18; anal 12 or 13; scales 55 to 60; 36 to 38 around middle of body; no black spot on base of pectorals. (This species may be the same as *palmas*.)
Polypterus lowei Boulenger

¹¹ Notes Leyden Mus., vol. 3, p. 71, 1881.

¹² Ibid., vol. 16, p. 19, 1894.

¹³ Proc. U. S. Nat. Mus., vol. 56, p. 248, 1919.

¹⁴ Cat. fresh-water fishes Africa, vol. 3, p. 124, 1915.

¹⁵ Notes Leyden Mus., vol. 16, p. 50, 1894.

¹⁶ Ibid., p. 20.

¹⁷ Notes Leyden Mus., vol. 3, p. 71, 1881.

¹⁸ Cat. fresh-water fishes Africa, vol. 3, p. 126, 1915.

¹⁹ Compt. Rend. Acad. Sci. Paris, vol. 174, pp. 884, 885, 1922.

²⁰ I am very grateful to the Geographical Institute of Harvard University for permission to trace the river systems on that map, and to insert the localities of Dr. Mann and others.

Genus **POLYPTERUS** Lacepède

Polypterus LACEPÈDE, Hist. Nat. Poiss., vol. 5, p. 340, 1803.

POLYPTERUS PALMAS Ayres

Polypterus palmas AYERS, Proc. Bost. Soc. Nat. Hist., vol. 3, p. 181, 1850.—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 92, 1894 (Fischermann See; Junk and Sulymah Rivers; Buluma; Mahfa River).—BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 16, 1900 (Liberia).—PELLEGRIN, Poiss. Afr. Occid., p. 37, 1923 (Liberia).

Polypterus büttikoferi STEINDACHNER, Notes Leyden Mus., vol. 13, p. 179, 1891 (Mahfa and Sulymah Rivers, Liberia).

The following specimens were collected by Dr. Wm. M. Mann:

U.S.N.M. No. 118747, 2 specimens, 125 and 132 mm., Bendaja.

U.S.N.M. No. 118748, 1 specimen, 213 mm., Gibi Mountain.

POLYPTERUS LOWEI Boulenger

Polypterus lowei BOULENGER, Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 377, 1911 (Nanna Kru, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 4, p. 151, fig. 102, 1916 (Nanna Kru, Liberia).—PELLEGRIN, Poiss. Afr. Occid. p. 37, 1923 (Liberia).

This species may be the same as *P. palmas*, since my counts are intermediate between *palmas* and *lowei*.

Family **CLUPEIDAE**

I am not able to identify "*Clupea senegalensis* (sp. Benn. C. V.) Gthr" listed by Steindachner²¹ with any fresh-water clupeids from Liberia.

Genus **PELLONULA** Günther

Pellonula GÜNTHER, Cat. Fish. British Mus., vol. 7, p. 452, 1868.

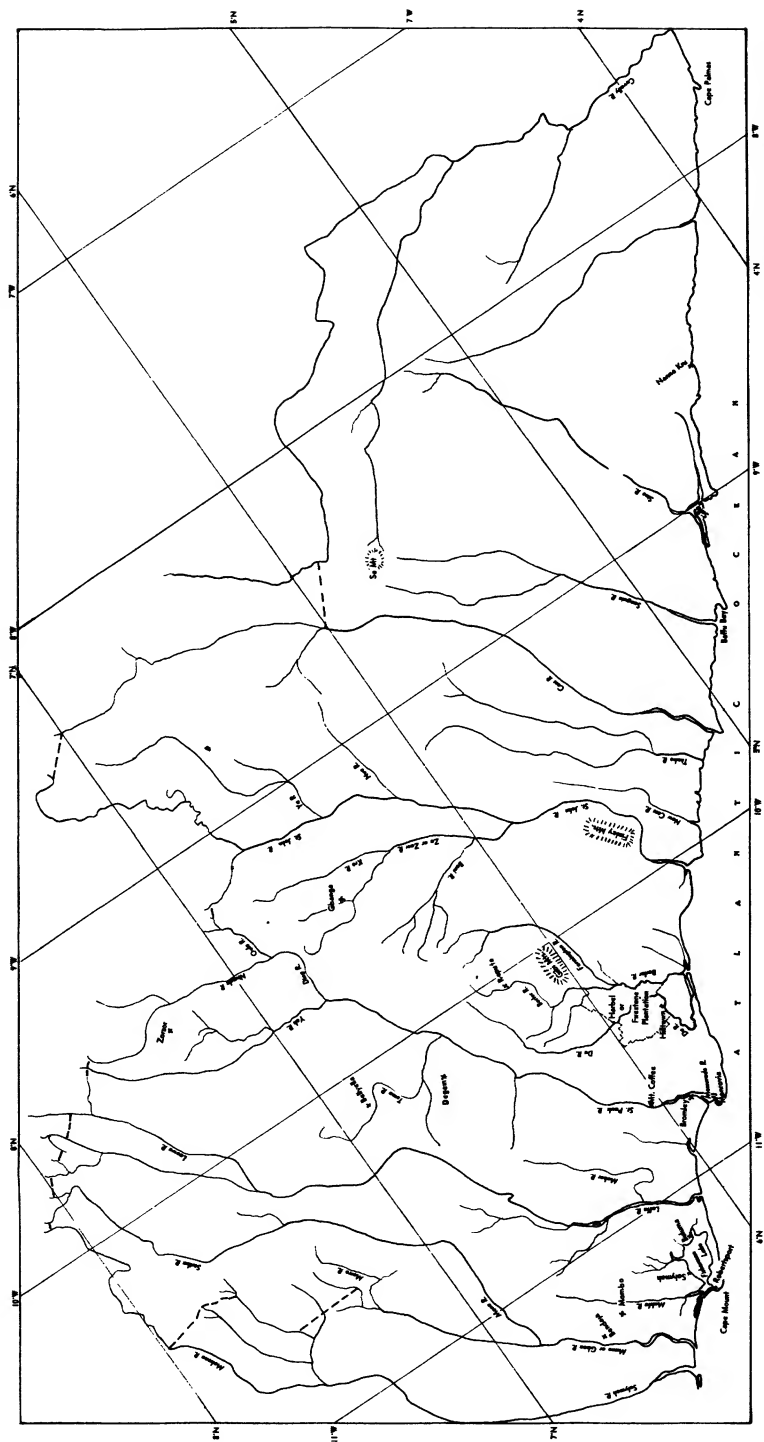
PELLONULA VORAX Günther

Pellonula vorax GÜNTHER, Cat. Fish. British Mus., vol. 7, p. 452, 1868.—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 83, 1894 (Robertsport).

Although the 2 specimens, U.S.N.M. No. 118733, measuring 67.2 and 91.5 mm. standard length, collected by Dr. Mann at Harbel, are referred to *P. vorax*, they may represent a new subspecies, but the lack of comparative material causes me to hesitate to describe them at this time. The chief distinction between *vorax* and these two specimens is the position of the anal, farther back, its origin $\frac{1}{2}$ the length of anal base behind base of last dorsal ray.

I give the following detailed description of the above 2 specimens from Harbel. All measurements are expressed in hundredths of the standard length, 91.5 and 67.2 mm., respectively.

²¹ Notes Leyden Mus., vol. 16, p. 81, 1894.



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FIGURE 37.—LIBERIA. This map was modified from a map of Liberia printed by the Institute of Geographical Exploration, Harvard University. Acknowledgment is made to the Geographical Institute of Harvard University for permission to trace the river systems.

Diagnosis.—Length of head 25.2 and 25.2; greatest depth 27.6 and 30.8; length of snout 7.65 and 7.89; diameter of eye 8.96 and 8.93; postorbital length of head 9.40 and 9.38; least width of interorbital space 4.70 and 4.48; length from tip of snout to rear of maxillaries 11.7 and 10.9; least depth of caudal peduncle 10.1 and 9.98; distance from base of last anal fin ray to midbase of caudal fin (length of caudal peduncle) 12.2 and 11.9; distance from tip of lower jaw (when mouth is opened so lower jaw is in line with axis of body) to rear of head 28.1 and 28.0; length of supramaxillary bone 6.22 and 6.25; snout to origin of dorsal 50.9 and 51.5; snout to origin of anal 75.0 and 73.1; snout to insertion of pelvics 50.2 and 50.7; snout to insertion of pectoral 25.4 and 25.2; length of longest ray —, of dorsal — and 17.1; of anal — and 9.68; of pelvics 13.8 and 14.3; of pectoral — and 17.4; of caudal 25.9 and 26.8. Length of base of dorsal 14.5 and 15.0; length of base of anal 17.7 and 18.0.

The following counts were made: Scales 45 and 44; transverse row at origin of dorsal 12 and 12; predorsal scales 17 and 17; dorsal rays iii, 14 and iii, 13; anal iii, 18 and iii, 17; pectoral 14 and 14; pelvic 8 and 8; gill rakers 12+26 and 11+28; keeled scutes 13+10 and 12+10.

Body much compressed, its width about $\frac{1}{3}$ its depth; abdomen sharp-edged; teeth on premaxillary in a single row, numbering 22, near lip, these teeth strong but none of them caninelike; teeth on dentary similar and in a single row, the posterior ones very small in a depression at side of lower jaw; maxillary with a broad expanded posterior part and a narrow shaft forward, the ventral border of the expanded part finely denticulate; supramaxillary with a narrow shaft forward; a single row of fine teeth along middle of tongue; a few teeth on the palatines; gill rakers long and slender; when the lower jaw is closed it projects a very little in front of snout but not beyond the forward-projecting teeth; when lower jaw is open it projects considerably in front of snout; origin of dorsal a very little closer to tip of snout than base of caudal fin and over base of pelvics; origin of anal fin $\frac{1}{2}$ length of base of anal fin behind rear base of dorsal; length of head shorter than greatest depth of body by $\frac{3}{4}$ diameter of eye; caudal peduncle a little deeper than long; keeled scales on belly from isthmus to anal fin origin.

Color.—A silvery lateral band, pigmented posteriorly and more or less continuing as blackish pigment in each lobe of the caudal fin; tip of snout and tip of lower jaw blackish.

Listed here are 2 small clupeid fishes in a very poor state of preservation, from Bromley, U. S. N. M. No. 118732, 21 and 28 mm. standard length, taken by Dr. Mann. These specimens appear to be close to the genus *Pellonula*.

Family NOTOPTERIDAE

KEY TO THE GENERA AND SPECIES OF NOTOPTERIDS FROM LIBERIA

- 1a. Dorsal fin present; body blackish to brownish with pale roundish markings posteriorly.....*Notopterus afer* Günther
 1b. No dorsal fin; uniform brownish or with fine darker lengthwise streaks.
Xenomystus nigri Günther

Genus NOTOPTERUS Lacepède

Notopterus LACEPÈDE, Hist. Nat. Poiss., vol. 2, p. 189, 1800. (Type: *Gymnotus kpirai* Bonn.)

NOTOPTERUS AFER Günther

Notopterus afer GÜNTHER, Cat. Fishes Brit. Mus., vol. 7, p. 480, 1868.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 71, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 83, 1894 (Fischermann See; St. Pauls River; mouth Junk R.).—BOULENGER, Cat. fresh-water fishes Africa, vol. 4, p. 170, 1916 (Nanna Kru, Liberia).—FOWLER, Proc. U. S. Nat. Mus. vol. 56, p. 232, 1919 (St. Pauls River, near Monrovia).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 515, p. 1, 1932 (Nanna Kru, Liberia).

The following are in the collection of the United States National Museum:

U.S.N.M. No. 48499, 1 specimen, 145 mm. standard length, St. Pauls River at Mt. Coffee, February 20, 1897, Rolla P. Currie.

U.S.N.M. No. 118768, 2 specimens, 225 and 232 mm., Bromley, W. M. Mann.

U.S.N.M. No. 118769, 15 specimens, 51 to 338 mm., Bendaja, W. M. Mann.

U.S.N.M. No. 118770, 43 specimens, 48 to 378 mm., Harbel, W. M. Mann.

Genus XENOMYSTUS Günther

Xenomystus GÜNTHER, Cat. fishes Brit. Mus., vol. 7, 479, 1868.

XENOMYSTUS NIGRI Günther

Xenomystus nigri GÜNTHER, Cat. fishes Brit. Mus., vol. 7, p. 481, 1868.—BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 148, 1909 (Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 78, 1923 (Liberia).

Notopterus (*Xenomystus*) *nigri* STEINDACHNER, Notes Leyden Mus., vol. 16, p. 85, 1894 (Fischermann See).

Family ANGUILLIDAE

Genus SPHAGEBRANCHUS Bloch

Sphagebranchus BLOCH, Naturg. ausländ. Fische, vol. 9, p. 88, 1795.

SPHAGEBRANCHUS CEPHALOPELTIS Bleeker

Sphagebranchus cephalopeltis BLEEKER, Nat. Verh. Vet. Haarlem, vol. 18, p. 128, 1863.

Ophichthys (*Sphagebranchus*) *büttikoferi* STEINDACHNER, Notes Leyden Mus., vol. 16, p. 88, 1894 ([Du River] at Hill Town).

Family MORMYRIDAE

KEY TO THE GENERA AND SPECIES OF MORMYRIDS REPORTED FROM LIBERIA

- 1a. Length of base of anal fin contained $2\frac{3}{4}$ times in length of base of dorsal fin; depth 4 to $4\frac{1}{2}$; head $3\frac{3}{4}$; dorsal 58 to 61; anal 21 to 24; pectoral 14 or 15; scales in lateral line about 80, but about 100 to 115 rows crossing body above the lateral line from gill opening to base of caudal fin; 11 or 12 scales around caudal peduncle; snout and mouth rounded, a little elongate and slightly curved downward; eye 3 in snout; snout $2\frac{1}{2}$ in head; least depth of caudal peduncle $4\frac{1}{2}$ in its length (base of anal to midbase of caudal fin); length of caudal peduncle $1\frac{1}{2}$ in head.

Mormyrus goheeni Fowler

- 1b. Base of anal fin longer, contained fewer than 2 times in length of base of dorsal fin.

- 2a. Teeth, 10 or more in both jaws and arranged in a single row.

- 3a. Mouth terminal, but a little inferior; dorsal fin base contained $1\frac{3}{4}$ to $1\frac{1}{2}$ in base of anal fin; posterior nostril about 1 eye diameter in front of eye; dorsal rays 21 to 27; anal 40 to 50; scales about 80 to 90; teeth about 17 to 23 above and 16 to 18 on lower jaw.

- 4a. Depth $6\frac{1}{2}$ to 7 times in standard length; head $4\frac{1}{2}$; the greatest depth is contained $2\frac{9}{10}$ times in distance from anus to base of caudal fin; and $1\frac{1}{2}$ times in distance from insertion of pelvics to origin of anal fin..... *Mormyrops breviceps* Steindachner

- 4b. Depth $5\frac{1}{2}$; head $3\frac{3}{4}$; depth $2\frac{2}{3}$ times in distance from anus to base of caudal fin; depth is equal to the distance from pelvic insertion to anal origin..... *Mormyrops deliciosus* (Leach)

- 3b. Mouth inferior; the snout rounded and extending in front of upper lip; base of dorsal fin contained $1\frac{1}{4}$ to $1\frac{1}{3}$ times in base of anal fin; both nostrils close together and very close to front margin of eye; dorsal rays 24 to 28; anal 30 to 34; pectoral 9; depth about 3 in standard length; teeth 12 to 14 on upper jaw and 21 to 24 on lower jaw; 11 or 12 scales around caudal peduncle; 37 or 38 scales in lateral line but 54 or 55 rows crossing body above lateral line from gill opening to base of caudal fin (anterior $\frac{2}{3}$ of base of anal fin on males concave and somewhat swollen..... *Petrocephalus simus* (Sauvage)

- 2b. Teeth fewer than 10 in both jaws and uniserial; posterior nostril an eye's diameter in front of eye.

- 5a. Depth 8 to 11 times in standard length; mouth somewhat inferior; base of dorsal fin a little longer than anal fin base, the latter contained about 1.1 to 1.2 times in dorsal fin base; dorsal rays usually 40 to 45; anal 40 to 44; pectoral 9; scales usually 130 to 135; teeth 5 or 6 in upper jaw and 6 in lower jaw; eye small, contained about 10 times in head.

Isichthys henryi Gill

- 5b. Greatest depth 3 to 6 times in standard length; mouth terminal or subinferior; base of dorsal fin shorter than anal fin base.

- 6a. Mouth a little inferior (subinferior) in position and below level of eye; dorsal fin base contained $1\frac{1}{2}$ times in anal fin base; depth $4\frac{1}{3}$ to 6 times in standard length, and head $4\frac{1}{2}$ to $6\frac{1}{3}$ times; dorsal rays 15 to 18; anal usually 26 to 28; pectoral 9; scales about 57 to 60; 12 scales around caudal peduncle; pelvic fins a little closer to pectoral base than anal origin..... *Marcusenius brachyistius* Gill

6b. Mouth terminal, the chin a little enlarged; depth $3\frac{1}{3}$ to $4\frac{1}{2}$ times in standard length, and head $4\frac{1}{2}$ to 5 times; base of dorsal fin contained $1\frac{1}{4}$ to $1\frac{1}{2}$ in base of anal fin.

7a. Dorsal rays 29 to 33; anal about 36; scales about 84 or 85; 12 scales around caudal peduncle (after Boulenger).

Gnathonemus mento (Boulenger)

7b. Dorsal rays 27 or 28; anal 30 to 32; scales about 55 to 57; 12 scales around caudal peduncle (after Boulenger).

Gnathonemus ussherli (Günther)

Genus MORMYRUS Linnaeus

Mormyrus LINNAEUS, *Systema naturae*, ed. 10, p. 327, 1758. (Type: *Mormyrus cyprinoides* Linnaeus.)

MORMYRUS GOHEENI Fowler

Mormyrus goheeni FOWLER, *Proc. U. S. Nat. Mus.*, vol. 56, p. 234, fig. 7, 1919 (type and 4 paratypes from St. Pauls River, Liberia).

The following specimens, from St. Pauls River, were collected by Rolla P. Currie:

U.S.N.M. No. 48517 (holotype).

U.S.N.M. Nos. 48514–48516, and 48518 (paratypes).

Genus MORMYROPS Müller

Mormyrops MÜLLER, in Wiegmann's *Arch. Naturg.*, p. 324, 1843. (Type: *Mormyrus anguilloides* G. St. Hilaire.)

MORMYROPS BREVICEPS Steindachner

Mormyrops breviceps STEINDACHNER, *Notes Leyden Mus.*, vol. 16, p. 66, 1894 (St. Pauls River).—BOULENGER, *Cat. fresh-water fishes Africa*, vol. 1, p. 36, 1909 (St. Pauls River).—PELLEGRIN, *Poiss. eaux douces Afr. Occid.*, p. 48, 1923 (Liberia).

U.S.N.M. No. 118805 contains 2 specimens, 159 and 195 mm., collected by Dr. Mann at Harbel.

The following data from above-listed specimens: Dorsal rays 25 and 26; anal 41; pectoral 10; scales 88 and 89; 16 scales around caudal peduncle; teeth $\frac{19}{16}$; $\frac{17}{16}$; origin of dorsal over twelfth ray of anal.

MORMYROPS DELICIOSUS (Leach)

Omyrhynchus deliciosus LEACH, in Tuckey, *Exped. R. Zaire*, p. 410, 1818.

Mormyrops deliciosus HUBRECHT, *Notes Leyden Mus.*, vol. 3, p. 170, 1881 (St. Pauls River).—STEINDACHNER, *Notes Leyden Mus.*, vol. 16, p. 65, 1894 (St. Pauls River).—BOULENGER, *Cat. fresh-water fishes Africa*, vol. 1, p. 32, 1909 (West Africa).—FOWLER, *Proc. U. S. Nat. Mus.*, vol. 56, p. 234, 1919 (St. Pauls River).

U.S.N.M. No. 48500 contains 1 specimen, 142 mm. standard length, from St. Pauls River at Mt. Coffee, collected by Rolla P. Currie. It

has the following data: Dorsal rays 26; anal 44; pectoral 10; scales 80; teeth $\frac{21}{18}$.

Genus PETROCEPHALUS Marcusen

Petrocephalus MARCUSEN, Bull. Acad. Sci. St. Petersburg, vol. 12, p. 10, 1854.
(Type: *Mormyrus bane* Valenciennes.)

PETROCEPHALUS SIMUS (Sauvage)

Mormyrus (Petrocephalus) simus SAUVAGE, Bull. Soc. Philom., vol. 3, p. 100, 1878.

Petrocephalus simus BOULENGER, Cat. Fresh-water fishes Africa, vol. 1, p. 54, 1909 (Duqueah River, Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 51, 1923 (Liberia).

Mormyrus tenuicauda STEINDACHNER, Notes Leyden Mus., vol. 16, p. 63, 1894 (Duqueah and Junk Rivers).

The following specimens, collected by Dr. Mann, are in the National Museum collections:

U.S.N.M. No. 118801, 20 specimens, 70 to 118 mm., Bromley.

U.S.N.M. No. 118802, 2 specimens, 63 and 66 mm., BendaJa.

U.S.N.M. No. 118803, 4 specimens, 57 to 86 mm., Bellyella.

U.S.N.M. No. 118804, 18 specimens, 58 to 92 mm., Harbel.

Genus ISICHTHYS Gill

Isichthys GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 443. (Type: *Isichthys henryi* Gill.)

ISICHTHYS HENRYI Gill

Isichthys henryi GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 44 (Liberia).—

BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 60, 1909 (Liberia).—

NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

Mormyrops henryi HUBBRECHT, Notes Leyden Mus., vol. 3, p. 70, 1881 (St. Pauls River).

Mormyrus henri STEINDACHNER, Notes Leyden Mus., vol. 16, p. 66, 1894 (St. Pauls River and Duqueah River).

The United States National Museum collections contain the following specimens, all collected by Dr. Mann:

U.S.N.M. No. 118797, 19 specimens, 81 to 256 mm., Bromley.

U.S.N.M. No. 118799, 14 specimens, 85 to 265 mm., BendaJa.

U.S.N.M. No. 118800, 86 specimens, 70 to 257 mm., Gibi Mountain.

U.S.N.M. No. 118798, 38 specimens, 68 to 276 mm., Harbel.

Genus MARCUSENIUS Gill

Marcusenius GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 139. (Type: *Marcusenius brachyistius* Gill [not *M. cyprinoides* L. as designated in Jordan's Genera of fishes and not *M. anguilloides* L. as given by Gill, ibid., p. 444].)

MARCUSENIUS BRACHYISTIUS GILL

Marcusenius brachyistius GILL, Proc. Acad. Nat. Sci. Philadelphia, p. 139, 1862 (Liberia).

Marcusenius brachistius BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 67, 1909 (Liberia); vol. 4, p. 153, 1916 (Nanna Kru, Liberia).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

Mormyrus liberiensis STEINDACHNER, Notes Leyden Mus. vol. 16, p. 67, 1894 (Sulymah and Junk Rivers; Fischermann See).

The following specimens are in the National Museum collections:

U.S.N.M. No. 4098 (type of *Marcusenius brachyistius* Gill), Liberia.

U.S.N.M. No. 118782, 13 specimens, 56 to 113 mm., Bromley, W. M. Mann.

U.S.N.M. No. 118783, 30 specimens, 48 to 135 mm., Bendaja, W. M. Mann.

U.S.N.M. No. 118784, 58 specimens, 42 to 135 mm., Harbel, W. M. Mann.

U.S.N.M. No. 118785, 17 specimens, 52 to 115 mm., Gibi Mountain, W. M. Mann.

Genus GNATHONEMUS Gill

Gnathonemus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 444. (Type: *Mormyrus petersi* Günther.)

GNATHONEMUS MENTO (Boulenger)

Mormyrus mento BOULENGER, Ann. Mag. Nat. Hist., ser. 6, vol. 6, p. 103, 1890.

Gnathonemus mento STEINDACHNER, Notes Leyden Mus., vol. 16, p. 72, 1894 (Sulymah River).—BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 106, fig. 86, 1909 (Liberia)—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 63, 1923 (Liberia).

GNATHONEMUS USSHERI (Günther)

Mormyrus ussheri GÜNTHER, Ann. Mag. Nat. Hist., sér. 3, vol. 20, p. 116, 1867—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 71, 1894 (Duqueah River).

Gnathonemus ussheri BOULENGER, Cat. fresh-water fishes Africa, vol. 1, p. 116, fig. 95, 1909 (Liberia)—PELLEGRIN, Poiss. eaux douces Afr. Occid. p. 67, 1923 (Liberia).

Family MASTACEMBELIDAE**Genus MASTACEMBELUS Scopoli**

Mastacembelus SCOPOLI, Introduc. hist. nat. Prague, p. 453, 1777.

MASTACEMBELUS LIBERIENSIS Boulenger

Mastacembelus marcheii (not Sauvage) STEINDACHNER, Notes Leyden Mus., vol. 16, p. 31, 1894 (Fischermann See, Liberia).

Mastacembelus liberiensis BOULENGER, Trans. Zool. Soc., vol. 15, p. 23, 1898 (Liberia).

The specimens before me do not agree exactly with Boulenger's or Steindachner's descriptions so I am adding the following supplemental observations: Margin of dorsal, caudal, and anal pale, color pattern reticulated, the pale circular areas small anteriorly and most distinct ventrally on sides, the belly being pale, the pale circular areas large posteriorly so only two rows occur on tail region, these extended

on median fins; anteriorly the back is paler, somewhat set off by a blackish wavy line most distinct on head; base of pectoral blackish, sometimes with one or two more blackish bars distally; depth about 13 or 14 in length; 20 or 21 scales between origin of soft dorsal and lateral line; a moderately strong, slender preorbital spine and 2 or 3 preopercular spines (usually 2); the anus is located progressively farther forward with increase in size as indicated from following measurements: The anus is midway from—tip of tail to back of eyes (70 mm. specimen), tip of tail to middle of eye (on 99 and 130 mm. specimens), tip of tail to front of eye (175 mm.), tip of tail to middle of snout (219 mm.), tip of tail to tip of lower jaw (267 mm.); and tip of tail to tip of projecting fleshy snout (360 mm.). (Table 1.)

Dr. Mann collected specimens as follows:

U.S.N.M. No. 118749, 2 specimens, 267 to 277 mm., Gibi Mountain.

U.S.N.M. No. 118750, 3 specimens, 70 to 300 mm., Harbel.

U.S.N.M. No. 118751, 6 specimens, 99 to 219 mm., BendaJa.

U.S.N.M. No. 118752, 24 specimens, 147 to 369 mm., Bromley.

TABLE 1.—Counts were made on specimens of *M. liberiensis* from Liberia

	Dorsal rays								
	Spines						Soft rays		
	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	84	85	86
Number of counts....	1	-----	-----	3	9	1	2	-----	1

	Anal rays				
	II, 82	II, 83	II, 84	II, 85	II, 86
Number of counts....	1	-----	1	1	1

Family CHARACINIDAE

KEY TO THE CHARACINS FROM LIBERIA

1a. Teeth, in outer row, slender, mostly bifid, set very close together near front of lips, and not at sides of mouth, the latter small.

2a. Lateral line complete; upper jaw freely movable; anus $\frac{1}{2}$ head length in front of anal fin origin; gill membranes attached to isthmus; scales about 43 or 44, $4\frac{1}{2}$ above and $4\frac{1}{2}$ below lateral line; 8 or 9 scales from rear of adipose fin to base of caudal fin; 10 or 11 scales in front of dorsal; dorsal rays iii, 10; anal iii, 7; gill rakers about 3 + 6. Color.—10 or 11 narrow brownish saddles on back more or less joining brown blotches below, that form a wide but broken lateral band; dorsal with two dark cross bars and pelvics with one bar.

Nannocharax seiboldi, new species

2b. Lateral line incomplete with only a few pores anteriorly just behind head; upper jaw barely or only slightly movable; anus close to anal origin;

gill membranes mostly free from isthmus, joined far forward; scales ciliated, 32 to 36, 10 in a transverse series to pelvic base; 13 or 14 scales before dorsal fin; dorsal rays iii, 7 or 8; anal iii, 6 or 7; gill rakers about 10 on lower part of first arch; a black lateral band from snout to tips of caudal fin rays.....*Neolebias unifasciatus* Steindachner

1b. Teeth in outer row caninellike or short and bluntly conical; upper jaw not movable; lateral line complete; gill membranes free from isthmus.

3a. Scale rows more numerous than 40, crossing sides of body; outer row of teeth strong canines.

4a. Scales about 47, $7\frac{1}{2}$ above lateral line and $2\frac{1}{2}$ below it to pelvic fin base; 18 scales before dorsal; dorsal rays ii, 8; anal iii, 14; gill rakers 7 or 8 + 10. Color.—Lengthwise brown streaks along each row of scales on sides of body; adipose fin black.

Hydrocyon forskalli Cuvier

4b. Scales about 61, $9\frac{1}{2}$ above and $4\frac{1}{2}$ below lateral line; about 42 scales in front of dorsal fin; dorsal rays ii, 7; anal iii, 9; gill rakers 5+1+10; adipose fin blackish; 3 black streaks and 2 white ones between them radiate backward from eye, another white streak below eye.

Hepsetus odo (Bloch)

3b. Scale rows crossing sides 20 to 33; outer row of teeth short, bluntly conical; dorsal rays ii or iii, 8.

5a. At tip of lower jaw occurs a pair of short conical caninellike teeth inside the outer row of multifid teeth.

6a. Anal rays iii, 18 to 20; scales 29 or 30, $5\frac{1}{2}$ above and $2\frac{1}{2}$ below lateral line; about 13 scales in front of dorsal fin; gill rakers 9 or 10 + 12 to 15; a large, oblong black blotch on caudal peduncle extending to tips of mid-rays of caudal fin. Depth $2\frac{1}{2}$ (males) to $3\frac{1}{2}$ in standard length; origin of dorsal from midway (seldom) to a little closer to tip of snout than base of caudal fin; least depth of caudal fin $2\frac{1}{4}$ to $2\frac{1}{2}$ in head.

Alestes longipinnis (Günther)

6b. Anal rays 11 to 15; gill rakers 12 to 14 + 16 to 19.

7a. Anal rays iii, 14; scales 25 to 27; $5\frac{1}{2}$ above and $1\frac{1}{2}$ below the lateral line to base of pelvic fin; 9 scales before dorsal; a black blotch on caudal peduncle, not extending on caudal fin rays; a faint blotch behind head near midaxis; posterior margin of anal fin blackish; depth about $2\frac{3}{4}$ to 3 in standard length; origin of dorsal a trifle closer to tip of snout than of caudal fin; least depth of caudal peduncle $2\frac{1}{2}$ in head.....*Alestes nurse* (Rüppell)

7b. Anal rays iii, 12 or 13; scales 23 to 26, $4\frac{1}{2}$ above and $1\frac{1}{2}$ below lateral line; 9 or 10 scales before dorsal fin; a black oblong blotch on caudal peduncle that extends to tips of midcaudal fin rays; a black blotch behind head; depth $3\frac{3}{4}$ in standard length; origin of dorsal fin nearly an eye diameter closer to base of caudal fin rays than tip of snout; least depth of caudal peduncle $2\frac{1}{2}$ in head.....*Alestes rutilus* Boulenger

5b. At tip of lower jaw, no pair of conical teeth within the outer row of teeth; anal rays iii, 15 or 16; scales 24 to 26, $4\frac{1}{2}$ above and $1\frac{1}{2}$ below the lateral line; gill rakers about 6 + 13; a blackish lateral band narrow and obscure anteriorly but distinct and wider posteriorly, not extending on head nor on caudal fin; tip of dorsal black.

Petersius occidentalis (Günther)

Genus NANNOCHARAX Günther

Nannocharax GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 112, 1867. (Type: *Nannocharax fasciatus* Günther.)

NANNOCHARAX SEYBOLDI, new species

PLATE 35, FIGURE 1

Holotype.—U.S.N.M. No. 118757, 32.9 mm. in standard length (tip of snout to base of caudal fin rays), collected by Dr. Wm. M. Mann at Bellyella.

Paratypes.—1 specimen, U.S.N.M. No. 118759, collected by Dr. Mann at Bellyella; 3 paratypes, U.S.N.M. No. 118758, collected by Dr. Mann at Bromley.

Description.—Based on the holotype and 4 paratypes. Detailed measurements of 4 specimens are expressed in hundredths of the standard length, in table 2, for convenience in comparing these proportions with those for other species.

The long, slender teeth with bifid tips are set close together, numbering about 8 in the upper jaw and 10 in the lower. There are no teeth on the maxillary; the mouth is small and movable; the snout is somewhat pointed; interorbital space flat; eye large, about equal to length of snout; gill rakers short about 3+6; gill membranes attached to the isthmus a short distance forward; origin of dorsal a little behind pelvic insertion and a little closer to origin of adipose fin than to tip of snout; lateral line complete, extending along middle of side; pectoral fins long, and extending past pelvic insertion; pelvic fins reaching about halfway between anus and anal origin; caudal fin deeply forked; first branched ray of dorsal and anal fins longest; third ray of pelvic fin longest, the first two rays simple, and the next 7 branched, totaling 9 in that fin; the second pectoral ray longest, the first two rays of this fin simple.

There are 11 pale brown saddles on the back, 3 in front of dorsal fin, 2 under base of that fin, 4 between the dorsal and adipose fins, one under adipose and the last on caudal peduncle; the brownish saddles do not quite connect with 11 or 12 irregular brownish blotches along midsides that appear to be on the scales; under the scales and more deeply beneath the skin are 5 brown blotches along the midsides; pigment area at base of first few anal rays; paired fins pale; a brownish opercular spot; sides of snout with brown band and dorsal surface of snout brown; midbase of caudal fin brownish, and two other smaller pigment areas in each lobe of the caudal fin; two more or less distinct brownish bars across dorsal fin; ventrally the color is abruptly paler below the blotches along the sides.

Remarks.—This new species is closest to *N. intermedius* and may prove to be a subspecies of it when extensive collections have been made along the west coast of Africa. It differs from *intermedius* in

having 43 to 44 scale rows between head and base of caudal fin, 8 or 9 scales behind adipose fin, and 10 or 11 in front of the dorsal instead of 51 to 54; 13 or 14 and 12 or 13 respectively. The color patterns of *intermedius* and *seyboldi* are the same. *N. fasciatus* has a broader head and more robust body, with 12 or 13 scales behind the adipose fin and base of caudal instead of 8 or 9 as in *intermedius*. Possibly the specimen figured by Fowler²² as *N. taenia* is closely related to this new species. (Table 2.)

TABLE 2.—*Certain counts and measurements¹ made on three species of Nannocharax from West Africa*

Character	<i>N. seyboldi</i> , ² new species				<i>N. intermedius</i> ³		<i>N. fasciatus</i> ⁴
Standard length in millimeters.....	43.2	32.9	41.0	33.6	53.7	48.8	68.6
Length of head.....	24.3	26.7	26.8	25.6	23.8	22.7	22.9
Width of head.....	12.1	12.4	12.4	11.9	11.8	9.83	13.5
Length of snout.....	7.64	7.90	8.54	7.44	7.08	6.76	8.74
Greatest depth of body.....	17.4	21.0	18.8	19.3	18.8	17.0	23.3
Diameter of eye.....	7.40	8.51	7.80	8.93	6.70	6.35	5.83
Width of bony interorbital.....	4.86	5.48	5.12	5.36	4.28	4.51	5.68
Postorbital length of head.....	9.72	11.5	12.7	11.6	11.2	11.1	10.3
Distance from tip of snout to rear of maxillary.....	4.63	5.17	4.63	4.46	4.28	4.51	4.98
Length of caudal peduncle.....	16.9	18.2	17.8	19.3	18.2	19.1	16.8
Least depth of caudal peduncle.....	9.49	9.73	9.50	9.52	9.13	8.40	10.2
Distance from snout to:							
Origin of dorsal fin.....	44.9	45.3	45.4	43.2	44.0	41.0	43.0
Origin of adipose fin.....	82.2	84.2	84.9	86.0	80.0	77.2	80.2
Origin of anal fin.....	73.1	75.1	74.2	75.0	71.2	69.3	73.2
Insertion of pectoral fin.....	23.1	24.3	26.6	28.0	23.7	21.9	20.2
Insertion of pelvic fin.....	41.2	41.3	46.4	45.5	41.9	41.0	37.9
Middle of anus.....	66.2	62.6	64.8	64.9	60.6	58.6	60.6
Longest ray of:							
Dorsal fin.....	22.7	24.3	21.9	23.2	21.8	22.5	21.4
Anal fin.....	16.7	16.7	-----	16.4	14.3	15.2	16.9
Pectoral fin.....	22.0	24.0	21.2	19.3	19.6	17.2	23.3
Pelvic fin.....	28.9	25.5	24.4	23.5	23.3	23.2	29.3
Caudal fin.....	27.8	27.1	-----	-----	25.2	24.8	23.3
Pectoral rays.....	14	16	14	15	13	14	17
Dorsal rays.....	iii, 10	iii, 10	iii, 10	iii, 10	iii, 10	iii, 10	iii, 10
Anal rays.....	iii, 7	iii, 7	iii, 7	iii, 7	iii, 7	iii, 7	iii, 6
Number of scale rows.....	43	44	44	44	51	54	47
Scales above lateral line.....	4½	4½	4½	4	5½	5½	4½
Scales below lateral line.....	4½	4	4	4	5½	4½	4½
Scales in front of dorsal.....	10	11	11	11	13	12	10
Scales from adipose fin to base of caudal fin.....	9	8	8	8	13	14	13

¹ All measurements expressed in hundredths of the standard length.

² For locality data see description.

³ From Cameroons, vicinity Lolodorf and Etat.

⁴ From Cameroons.

It differs from other species of *Nannocharax* in the combination of fewer scales with the color pattern and a narrow head.

Named *seyboldi* after George Seybold, Firestone Plantation, Liberia, who extended much help to Dr. Mann.

²² Proc. Acad. Nat. Sci. Philadelphia, 1936, p. 270, fig. 20.

Genus **NEOLEBIAS** Steindachner

Neolebias STEINDACHNER, Notes Leyden Mus., vol. 16, p. 78, 1894. (Type: *Neolebias unifasciatus* Steindachner.)

NEOLEBIAS UNIFASCIATUS Steindachner

Neolebias unifasciatus STEINDACHNER, Notes Leyden Mus., vol. 16, p. 78, 1894 (Robertsport, Liberia).—Boulenger, Cat. fresh-water fishes Africa, vol. 1, p. 256, fig. 195, 1909 (Robertsport, Liberia).

Genus **HYDROCYON** Cuvier

Hydrocyon CUVIER, Mém. Mus. Paris, vol. 5, p. 353, 1819. (Type: *H. forskali* Cuvier.)

HYDROCYON FORSKALI Cuvier

Hydrocyon forskali CUVIER, Mém. Mus. Paris, vol. 5, p. 354, pl. 28, 1819.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 70, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 62, 1894 (St. Pauls River).—FOWLER, PROC. U. S. Nat. Mus., vol. 56, p. 238, 1919 (St. Pauls River near Monrovia).

U.S.N.M. No. 48519 contains 1 specimen, 178 mm. standard length, from St. Pauls River near Monrovia.

Genus **HEPSETUS** Swainson

Hepsetus SWAINSON, Natural history and classification of fishes, amphibians and reptiles, vol. 1, p. 259–260, 1838. (Type: *Salmo odoë* Bloch, designated by Hubbs, 1939.)

Sarcodaces GÜNTHER, Cat. Fish. Brit. Mus. vol. 5, p. 353, 1864. (Type: *Salmo odoë* Bloch.)

HEPSETUS ODOË (Bloch)

Salmo odoë BLOCH, Naturg. ausländ. Fische, vol. 8, p. 122, pl. 386, 1794.

Sarcodaces odoë STEINDACHNER, Notes Leyden Mus., vol. 16, p. 63, 1894 (Fischer-mann See and Junk River, Liberia).

Dr. Mann collected the following specimens:

U.S.N.M. No. 118760, 2 specimens, 49 and 57 mm., Bromley.

U.S.N.M. No. 118761, 1 specimen, 179 mm., Harbel.

Genus **ALESTES** Müller and Troschel

Alestes MÜLLER and TROSCHER, Synop. gen. spec. fam. Characinarum; Wiegmann's Archiv. Naturg., p. 88, 1844. (Type: *Salmo niloticus* Geoffroy St. Hilaire.)

ALESTES LONGIPINNIS (Günther)

Brachyalestes longipinnis GÜNTHER, Cat. Fishes, Brit. Mus., vol. 5, p. 315, 1864.—

HUBRECHT, Notes Leyden Mus., vol. 3, p. 70, 1881 (St. Pauls River, Liberia).

Alestes (*Brachyalestes*) *longipinnis* STEINDACHNER, Notes Leyden Mus., vol. 16, p. 64, 1894 (St. Pauls River at Soforeh Place; Junk River, Liberia).

Alestes longipinnis FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 238, 1919 (St. Pauls River, near Monrovia).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

The following specimens are in the National Museum collections:

- U.S.N.M. No. 48520, 2 specimens, St. Pauls River, Liberia, Rolla P. Currie.
- U.S.N.M. No. 118762, 13 specimens, 53–85 mm., Bendaja, W. M. Mann.
- U.S.N.M. No. 118763, 3 specimens, 29–36 mm., Bellyella, W. M. Mann.
- U.S.N.M. No. 118764, 98 specimens, 50–93 mm., Harbel, W. M. Mann.
- U.S.N.M. No. 118765, 74 specimens, 18–87 mm., Bromley, W. M. Mann.
- U.S.N.M. No. 118766, 5 specimens, 55–76 mm., Gibi Mt., W. M. Mann.

ALESTES NURSE (Rüppell)

Myletes nurse RÜPPELL, Fortsetz. Beschr. Fische Nil, p. 12, pl. 2, fig. 3, 1832.

Brachyalestes nurse HUBBRECHT, Notes Leyden Mus., vol. 3, p. 70, 1881 (St. Pauls River, Liberia).

The collections of the National Museum contain the following specimens, taken by Dr. Mann:

- U.S.N.M. No. 118753, 2 specimens, 66 and 95 mm., Harbel.
- U.S.N.M. No. 118754, 1 specimen, 112 mm., Gibi Mt.

ALESTES RUTILUS Boulenger

Alestes rutilus BOULENGER, Catalog fresh-water fishes Africa, vol. 4, p. 181, fig. 116, 1916 (Sierra Leone).—FOWLER, Proc. U. S. Nat. Mus. vol. 56, p. 239, 1919 (St. Pauls River near Monrovia).

Alestes macrolepidotus HUBBRECHT, Notes Leyden Mus., vol. 3, p. 70, 1881 (St. Pauls River, Liberia).

Alestes (Brycinus) macrolepidotus STEINDACHNER, Notes Leyden Mus., vol. 16, p. 63, 1894 (St. Pauls River).

The United States National Museum has the following 2 specimens:

- U.S.N.M. No. 48521, 1 specimen, St. Pauls River near Monrovia, R. P. Currie.
- U.S.N.M. No. 118767, 1 specimen, 88 mm., Harbel, W. M. Mann.

Genus PETERSIUS Hilgendorf

Petersius HILGENDORF, Sitzber. Ges. Naturf. Berlin, 1894, p. 172. (Type: *P. conserialis* Hilgendorf.)

PETERSIUS OCCIDENTALIS (Günther)

Petersius occidentalis GÜNTHER, Proc. Zool. Soc. London, 1899, p. 731, pl. 45, fig. 8 (Gold Coast, Kotchwah River).

Dr. Mann collected specimens in two localities:

- U.S.N.M. No. 118755, 50 specimens, 32–42 mm., Gibi Mt.
- U.S.N.M. No. 118756, 53 specimens, 22–42 mm., Bromley.

Family CYPRINIDAE

KEY TO THE GENERA AND SPECIES OF CYPRINIDAE FROM LIBERIA

- 1a. Dorsal rays iii, 10 or 11; mouth inferior with a hard bony sheath or cutting edge inside the lips; groove of lower lip not interrupted by a frenum near tip of lower jaw; anterior barbel absent or rudimentary; posterior barbel shorter than eye concealed when mouth is closed, snout $1\frac{3}{4}$ to 2 in head; eye above midaxis of head, $5\frac{1}{4}$ to 7 times in the head; pelvics inserted under the 5th or 6th branched ray of dorsal; scales 35, 5 above and 4 below lateral line; anal iii, 5-----*Labeo curriei* Fowler
- 1b. Dorsal rays iii, 8, rarely 7 or 9 branched rays; mouth with the bony cutting edges inside of the lips.
- 2a. Anal rays iii, 10; cheeks $\frac{4}{5}$ covered by the suborbital bones; no barbels; scale rows on side of body 42, and $7\frac{1}{2}$ above and $1\frac{1}{2}$ below lateral line; 14 scales around caudal peduncle; $19\frac{1}{2}$ in front of dorsal fin; pelvic rays 9; pectoral 15; distance from origin of dorsal to midcaudal fin base equal to distance from origin of dorsal to occiput (or end of scaled region in front of dorsal); inner edges of lips finely plicate. Color.—Two irregular rows of blackish blotches anteriorly, the lower row ending with the 6th spot, but the upper row of 14 spots continuing to base of caudal fin (one of these on opercle)-----*Barilius sillex*, new species
- 2b. Anal rays iii, 5; cheeks less than $\frac{1}{2}$ covered by the suborbital bones, two pairs of barbels present; pelvic fin rays 8.
- 3a. Fine parallel lines of papillae on sides and top of head, in groups on side of snout, cheeks, opercular apparatus, and top of snout; scales radiately striated; two pairs of barbels; simple rays of dorsal not bony or enlarged, but thin and segmented; suborbital bones narrow; lateral line complete; scale rows 22 to 24, usually 23; scales above lateral line $3\frac{1}{2}$, below $2\frac{1}{2}$; scales around caudal peduncle 10, and front of dorsal 8, rarely 9; pectoral 16 or 16; pelvics 8. Color.—A black band along midaxis of body and on snout, also on midrays of caudal fin but more diffuse.
Mannichthys lucileae, new genus and species
- 3b. Parallel lines of fine papillae or pores not occurring in groups on sides of snout, cheeks, and top of snout.
- 4a. Posterior suborbital bone under rear half of eye enlarged, 3 times wider than the adjacent anterior suborbital bone under the front half of eye; the expanded suborbital bone covers $\frac{2}{3}$ of the cheek the next-to-the-last simple ray of dorsal and anal fins movable and connected to the last simple ray by a membrane similar to that between the other rays; dorsal rays iii, 8; rarely iii, 7; scale rows 25 or 26; $3\frac{1}{2}$ above and $2\frac{1}{2}$ below lateral line; 12 scales around caudal peduncle and 10 in front of dorsal fin; a blackish band along midaxis more or less broken into 4 oblong spots.
Barbus flomoi, new species
- 4b. Suborbital bones below eye, both of the same approximate width, and narrow, not covering $\frac{1}{4}$ the cheek.
- 5a. Three large, roundish black spots along midaxis of body, first in front of dorsal, second over anal origin, and third on caudal peduncle; scales 24 to 26, usually 25, and $3\frac{1}{2}$ above and $2\frac{1}{2}$ scales below lateral line; scales around caudal peduncle 12, and

in front of dorsal 8; pelvics under the first and second branched rays of dorsal fin; depth of caudal peduncle $1\frac{1}{4}$ in its length; posterior barbel, $1\frac{1}{2}$ to $1\frac{3}{4}$ in eye; anterior barbel $1\frac{1}{2}$ in eye.....*Barbus trispilus* (Bleeker)

5b. Color not as in 5a.

6a. A large oval black spot at rear of caudal peduncle; midaxis of body with an indistinct narrow blackish line; scales crossing lateral line 27 or 28, with $4\frac{1}{2}$ above and $2\frac{1}{2}$ below lateral line; 12 scales around caudal peduncle and usually 10 (rarely 11) in front of dorsal, both barbels about length or trifle longer than eye.....*Barbus boboi*, new species

6b. Color not as in 6a.

7a. Scales 26 or 27, with $3\frac{1}{2}$ above and $2\frac{1}{2}$ below lateral line; 10 scales in front of dorsal and 12 around caudal peduncle; posterior barbel $1\frac{1}{4}$ in eye; eye longer than snout $2\frac{3}{4}$ in head; black lateral band distinct, continuing on snout; no large black spots.....*Barbus ablakes* (Bleeker)

7b. Scales 21 or 22, with $3\frac{1}{2}$ above and $2\frac{1}{2}$ below lateral line; 8 scales in front of dorsal and 10 around caudal peduncle; barbels very small $\frac{1}{2}$ to $\frac{2}{3}$ eye; pectorals either reach or almost reach pelvic insertion; no large black spots; blackish lateral band, indistinct or absent; depth 3 to $3\frac{1}{2}$ in standard length.....*Barbus spurrelli* Boulenger

Genus LABEO Cuvier

Labeo CUVIER, Règne animal, vol. 2, p. 194, 1817. (Type: *Cyprinus niloticus* Geoffroy.)

LABEO CURRIEI Fowler

Labeo curriei FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 236, fig. 8, 1919.

The National Museum collections contain the following:

U.S.N.M. No. 48512 (holotype), total length 210 mm., standard length, 160 mm., St. Pauls River, Liberia.

U.S.N.M. No. 48513, 3 paratypes, 115–134 mm., standard length, St. Pauls River, Liberia.

Genus BARILIUS Hamilton

Barilius HAMILTON, Acc. fishes. Riv. Ganges, p. 384, 1822. (Type: *Cyprinus barila* Hamilton).

BARILIUS SILEX, new species

PLATE 35, FIGURE 2

Holotype.—U.S.N.M. No. 118736, 79 mm. standard length, collected by Dr. Wm. M. Mann at Bromley, Liberia.

Description.—Based on the holotype, the only known specimen. All measurements are expressed in hundredths of standard length. Total length about 99.5 mm. (the tail fin somewhat broken). Length

of head 29.7; length of snout 8.6; greatest depth of body 24.7; diameter of eye 8.5; width of fleshy interorbital space 8.9; postorbital length of head 14.8; least preorbital or distance from eye to lower edge of preorbital above the maxillary 2.28; distance from tip of snout to rear of maxillary 16.2; length of base of dorsal fin 11.1; length of base of anal fin 14.4; length of caudal peduncle or distance from rear base of last anal ray to base of midcaudal fin rays 17.3; least depth of caudal peduncle 10.1; distance from snout to origin of dorsal 58.8; snout to origin of anal 70.9; snout to insertion of pelvics 54.2; length of longest ray of dorsal fin 17.8; length of longest ray of pectoral fin 21.3; length of longest ray of pelvic fin 13.7; length of longest ray of anal fin 14.3; length of longest ray of caudal fin 29.1; width of body behind head 11.5.

The following counts were made: Gill rakers on first gill arch of one side 2+5, short and rudimentary; scale rows on side of body from gill opening to base of caudal fin 42; scales above lateral line $7\frac{1}{2}$ and below lateral line $11\frac{1}{2}$; scale around caudal peduncle 14; scales in front of dorsal fin $19\frac{1}{2}$; dorsal rays iii, 8; anal iii, 10; pectoral 15; pelvics 9; pharyngeal teeth on one side 4:3:2.

This new species has a compressed body; no barbels; the maxillaries extend to below rear of eye; the eye is equal to the length of the snout, and about 3 times in the head; the origin of the dorsal fin is farther back than usual as the distance from the origin of the dorsal fin to mid-base of caudal fin equals the distance from origin of dorsal to anterior edge of scaled portion in front of dorsal; mouth large, oblique, when closed a small symphyseal knob on lower jaw fits into a notch in tip of snout, the latter not projecting in front of jaws; the inner edges of the lips are finely plicate; the gill membranes extend a short distance forward before becoming narrowly joined to the isthmus; suborbital bones greatly expanded covering $\frac{4}{5}$ or more of the cheeks; interorbital space almost flat, a trifle convex; dorsal profile almost straight, a little convex in front of eyes; the large axillary scales of pectoral and pelvic fins have an enlarged keel, this scale being connected with the fin by a dermal membrane on both pectoral and pelvic fins; mandible with numerous pores not arranged in lines; premaxillary protractile; lateral line below axis of body, complete; the almost parallel striae on scales slightly divergent.

Color (in alcohol).—Silvery on sides; pale tan above; on level of lower half of eye anteriorly but along mid-axis of caudal peduncle is a row of 13 oval blackish spots, the largest smaller than the eye and on opercle another spot, thus totaling 14; anteriorly below and between the black blotches, just above the lateral line are 9 smaller blackish spots; upper margin of eye pigmented; posterior dermal

margin of opercle pigmented; tip of lower jaw and upper lips with blackish pigment; tips of anterior dorsal rays white, then a diffuse blackish bar from middle of rays extends across dorsal fin to tips of last dorsal rays; base of dorsal pale; other fins pale; peritoneum silvery with scattered black pigment cells.

Remarks.—This new species of *Barilius* is closest to *B. steindachneri* Pellegrin and *B. engrauloides* Nichols. From *steindachneri* it differs in the more backward position of the dorsal, as in that species the distance from origin of dorsal to midbase of caudal fin is a little greater than the distance from origin of dorsal to front of eye, and the distance from dorsal origin to midbase of caudal fin is a little greater than to occiput in *B. silex*. *B. steindachneri* has 38 to 40 scales and 11 to 13 branched anal rays instead of 42 scales and 10 branched anal rays in the new species. *B. engrauloides* has 37 scales and 12 around the caudal peduncle instead of 42 and 14 respectively for *B. silex*. The color pattern consisting of two rows of alternating blackish blotches, anteriorly, on *B. silex* is a feature of the color pattern differing from any other species of *Barilius*, at least from western Africa.

Named *silex*, meaning flint stone but once used as a "firestone," in reference to the Smithsonian-Firestone Expedition to Liberia.

MANNICHTHYS, new genus

This new genus is characterized by its radiately striated scales, complete lateral line, two pairs of barbels; the simple rays of the dorsal and anal fins are weak, not enlarged and bony but cross-striated and close together; the pelvics are inserted about under the base of the first branched dorsal ray; the pharyngeal teeth are 5:3:2-2:3:5 to 4:3:2-2:3:4; dorsal fin rays iii, 8; anal iii, 5; suborbitals narrow.

The most important character of this new genus consists of the fine lines of papillae or pores, almost parallel, in groups on the sides of the snout, cheeks, opercular apparatus, between the dentary bones on lower jaw, and on dorsal anterior surface of head. In regard to the character of the parallel lines of pores this new genus resembles the Asiatic genera *Cyclocheilichthys* and *Oreichthys* Smith. It differs from the former genus in the absence of bony denticulated simple dorsal rays and from the latter in having two pair of barbels and a complete lateral line.

This new genus differs from *Barbus* as applied to certain African cyprinids in having the lines of pores on the head. It traces through keys prepared by Boulenger, by Holly, and by Pellegrin on African fishes to the genus *Barbus*, but the species referred to that genus do not have the lines of pores on the head.

Genotype.—*Mannichthys lucileae*, new species. Characters of the genus are those of the new species described below.

Named *Mannichthys* in honor of Dr. William Mann who helped collect the material on which this genus is based.

MANNICHTHYS LUCILEAE, new species

PLATE 35, FIGURE 3

Holotype.—U.S.N.M. No. 118746, 60.3 mm. standard length, collected near Bromley by Dr. Mann.

Paratypes.—U.S.N.M. No. 118744, 51 specimens, from 34 to 62 mm., were collected with the type and bear the same data; U. S. N. M. No. 118745, 38 specimens, 28 to 57 mm. standard length, were collected by Dr. Mann on Gibi Mountain; U. S. N. M. 50961, 4 specimens, 40 to 50 mm., from the Gold Coast, Africa.

Description.—This description is based on the holotype and 93 paratypes from Liberia and the Gold Coast. All measurements are expressed in hundredths of the standard length, those for the holotype are given first, followed by a paratype. Total length in mm. 76.7 and 65; standard length in mm. 60.3 and 52. Length of head 27.9; 27.9; length of snout 9.5; 8.85; greatest depth of body 29.4; 28.9; diameter of eye 9.5; 9.6; width of fleshy interorbital space 10.3; 10.8; postorbital length of head 12.8; 11.7; least preorbital or distance from eye to lower edge of preorbital 4.0; 3.3; distance from tip of snout to rear of maxillary 7.8; 7.9; length of anterior barbel 6.8; 6.55; length of posterior barbel 9.13; 7.5; length of caudal peduncle or distance from rear base of last anal ray to midbase of caudal rays 22.4; 20.2; least depth of caudal peduncle 13.3; 12.7; distance from snout to origin of dorsal 49.2; 49.0; snout to origin of anal 76.3; 74.8; snout to insertion of pelvics 51.1; 50.4; length of longest ray of dorsal 28.4; 26.9; length of longest ray of pelvic 20.7; 20.2; longest ray of pectoral 21.6; 20.2; longest ray of anal 18.2; 17.7; longest ray of caudal 29.9; —.

The following counts were made: Gill rakers on one paratype 2+5; scale rows crossing lateral line 23; 24; 22; 23; 22; 23; 22 and 22; scales above lateral line always $3\frac{1}{2}$, and below lateral line (pelvic insertion or anal origin) always $2\frac{1}{2}$; scales around caudal peduncle always 10; scales in front of dorsal 8; 8; 8; 8; 8; 8; 9; 9; dorsal rays always iii, 8, and anal always iii, 5; pectoral fin rays 16; 15; 15; 16; 16; 16; pelvics always with 8 rays. Pharyngeal teeth 5:3:2–2:3:5 to 4:3:2–2:3:4.

Below the suborbital bones on lower half of snout and on cheeks are vertical rows of tiny pores or papillae somewhat raised above the general level of the skin; on the lower part of the snout above the

mouth, beginning at the base of the anterior barbel and continuing posteriorly are parallel lines of pores, close together but on the cheek these lines are much farther apart; in front of isthmus on under side of head between dentary bones many of these lines of pores cross close together. A few of the vertical lines are present on the opercular apparatus. These parallel lines are most apparent on the top of the head between the front of the eyes and dorsal surface of the snout, but absent on tip of snout and along middle sides of snout where the blackish lateral band extends forward to tip of snout. Scales with the striae arranged like the spokes in a wheel (radiately striated); mouth short, a little oblique, not reaching to below front of eye; gill membranes broadly joined to the isthmus; snout bluntly rounded; premaxillaries protractile; lower lip with a frenum at tip of chin, the edge of lip not free across the chin; no frenum on upper lip; interorbital space flat; the dorsal contour from origin of dorsal to over front of eyes almost straight; the greatest depth of body at origin of dorsal; pectorals not quite reaching to insertion of pelvics and the latter reaching to anus but not quite to the anal fin origin; pectorals pointed, the upper ray longest; first rays of dorsal and anal longest; the posterior margin of the dorsal a little concave, that of the anal truncate to a trifle concave; caudal fin forked; gill rakers short and blunt 2+5; pelvics with accessory scale.

The color pattern consists of a black lateral band along the mid-axis of the body from tip of snout to midbasal portion of caudal fin rays more or less visible to tip of these rays on most specimens; on some specimens the black lateral band is more intense on the opercle almost forming a blackish blotch; posterior margin of the scales pigmented, intensely black along lateral line but not interrupted by the lateral line to form a light or pale streak along the lateral line; upper ray of pectoral a little blackish, second simple ray of dorsal blackish, anterior tip of dorsal fin blackish, this pigment sometimes including a little of the membrane of the third branched ray; other fins plain pale.

Remarks.—This new species may be closely related to *Barbus gambiensis* Svensson because the author mentions "head with numerous lines of fine pores likely belonging to the sensory lateral line system" but these are not shown in his figure unless they are represented by the lengthwise lines under the eye. *Barbus gambiensis* differs from the new species in having 12 scales around the caudal peduncle, 23 to 25 scale rows instead of 10 and 22 to 24 respectively. In addition the black line above the lateral black band is absent in *Mannichthys lucileae*.

Named *lucileae* in honor of Lucile Mann, wife and companion of Dr. William Mann.

Genus *BARBUS* Cuvier and Cloquet

Barbus CUVIER and CLOQUET, Dict. Nat., ed. 2, vol. 4, Suppl., p. 4, 1816.

BARBUS FLOMOI, new species

PLATE 36, FIGURE 1

Holotype.—U.S.N.M. No. 118737, 56.5 mm. standard length, collected near Bellyella, March 23–30, 1940, by Dr. Mann.

Paratypes.—U.S.N.M. No. 118738, 23 specimens, 27 to 60 mm. standard length, same collection data as the type.

Description.—Based on the holotype and 23 paratypes listed above. All proportional measurements expressed in hundredths of the standard length, those for the holotype first, followed by detailed measurements of a paratype. Total length 73.2; 50.8 mm. Standard length 56.5; 39.0 mm. Length of head 27.3; 27.4; length of snout 8.5; 9.0; greatest depth of body 29.9; 32.0; diameter of eye 6.4; 7.7; width of interorbital space 10.6; 10.5; postorbital length of head 14.5; 15.1; least preorbital or distance from eye to lower edge of preorbital above rear of maxillary 3.6; 3.6; distance from tip of snout to rear of maxillary 9.0; 8.5; length of anterior barbel 7.2; 7.4; length of posterior barbel 9.7; 11.0; length of caudal peduncle or distance from rear base of last anal ray to midbase of caudal fin 22.1; 24.3; least depth of caudal peduncle 14.9; 14.1; distance from snout to origin of dorsal 51.6; 51.0; snout to origin of anal 74.4; 69.8; snout to insertion of pelvics 50.0; 47.2; length of longest ray of dorsal 22.3; 24.3; length of longest ray of pelvic 17.0; 18.5; length of longest ray of pectoral 19.3; 20.8; length of longest ray of anal 16.3; 16.9; length of longest ray of caudal 28.1; 30.8.

The following counts were made: Gill rakers on one paratype were 2+4 or 5; scale rows crossing lateral line 26; 26; 25; 26; scales above lateral line 3½; 3½; and below lateral line 2½; 2½; scales around caudal peduncle always 12; scales in front of dorsal fin always 10; dorsal rays iii, 8; iii, 8; iii, 8; iii, 8; iii, 8; iii, 8; iii, 8; iii, 7; anal rays always iii, 5; pectoral rays 15; 16; pelvic rays always 8; pharyngeal teeth 5:3:2 or 2:3:5.

This new species has a somewhat compressed body; radiately striated scales; complete lateral line; two pair of barbels; the simple rays of the dorsal fin not bony, not enlarged or denticulate; absence of parallel lines of pores on the head; insertion of pelvic fins under or a very, very little in front of origin of the dorsal fin; pharyngeal teeth are 5:3:2; dorsal rays iii, 8, rarely iii, 7; anal iii, 5; the suborbitals are expanded, the bone below the rear of eye covering about ⅔ of the cheek, and the suborbital bone below front of eye about ⅓ the width of the posterior bone below rear of eye; the

next to the last simple ray of both dorsal and anal fins is movable and connected to the last simple ray by only a membrane; this next to the last simple ray of the dorsal fin is spine-like; the lips are thin, the groove of the lower lip is interrupted at the tip of the chin by a narrow frenum; premaxillary protractile; mouth a little oblique, the rear edge of the maxillary reaching to just underneath the front margin of the eye; pectorals not quite reaching to insertion of pelvics; pelvics not quite reaching to the anus; snout rounded, the lower jaw a little shorter than upper, the snout not projecting beyond premaxillary; caudal fin forked.

The color is brown above, paler below, with a blackish band along the midaxis broken into 4 blackish spots on some specimens which more or less fuse with the black band, or the spots are absent except the last at base of midcaudal fin rays; when the spots are present the first occurs just above the lateral line on about the 5th and 6th scale rows crossing the lateral line; the second black spot just behind and below rear of base of dorsal fin, the third above and just behind the rear base of anal fin usually is more diffuse and less distinct than the others and the last black spot more intense than the others at rear of caudal peduncle on midaxis; the posterior margins of the scales are strongly pigmented with blackish; lower lip black; upper lip and front of snout blackish; dorsal, pectoral and caudal fins dusky; anal and pelvics white; peritoneum pale with a few black specks.

Remarks.—This new species resembles somewhat *Barbus trispilus* but differs in its color pattern; the spots when present number 4 instead of 3; it differs from other cyprinids with a similar color pattern in having the suborbital bone below rear half of eye expanded, 3 times wider than the adjacent anterior suborbital bone, and covering at least $\frac{2}{3}$ of the cheek in combination with the free simple rays of dorsal and anal fins, the next to last simple ray attached to the last simple ray of these fins by a membrane and not at all fused or attached to it firmly.

Named *flomoi* after one of the Africans who helped Dr. Mann collect specimens.

BARBUS TRISPILUS (Bleeker)

Puntius (Barbodes) trispilus BLEEKER, Nat. Verh. Vet. Haarlem, vol. 18, No. 2, p. 113, pl. 23, fig. 2, 1863.

Barbus camptacanthus var. *libertiensis* STEINDACHNER, Notes Leyden Mus., vol. 16, p. 80, 1894 (Robertsport; Grand Cape Mt.).

Barbus trispilus BOULENGER, Cat. Fresh-water fishes Africa, vol. 2, p. 163, 1911 (Liberia).

U.S.N.M. No. 118739, contains 33 specimens, 30 to 79 mm. standard length, from Gibi Mountain, 900 feet elevation, collected by Dr. Mann.

BARBUS BOBOL, new species

PLATE 36, FIGURE 2

Holotype.—U.S.N.M. No. 118740, 41.5 mm. standard length, collected at about 900 feet elevation on Gibi Mountain (Mt. Si), April 10–16, 1940, by Dr Mann.

Paratypes.—U.S.N.M. No. 118741, 33 specimens, 28 to 52 mm. standard length, bearing same collection data as the type; U.S.N.M. No. 118742, 42 specimens, 32 to 48 mm., taken by Dr. Mann at Bromley; U.S.N.M. No. 118743, 1 specimen, 29 mm., collected by Dr. Mann at Harbel.

Description.—This description is based on the holotype and the 76 paratypes listed above. All measurements are expressed in hundredths of the standard length, those for the holotype first, followed by measurements of one of the paratypes. Total length 53.7; 48.0 mm. Standard length 41.5; 36.5. Length of head 29.6; 28.5; length of snout 7.7; 9.9; greatest depth of body 25.1; 23.3; diameter of eye 10.1; 9.9; width of fleshy interorbital space 8.2; 9.0; postorbital length of head 12.3; 12.1; least preorbital or distance from eye to lower edge of preorbital near rear of maxillary 2.2; 2.5; distance from tip of snout to rear of maxillary 8.4; 8.5; length of anterior barbel 12.8; 11.2; length of posterior barbel 13.0; 11.8; length of caudal peduncle or distance from rear base of last anal ray to midbase of caudal fin 20.7; 19.2; least depth of caudal peduncle 13.2; 13.2; distance from snout to origin of dorsal 50.8; 50.7; snout to origin of anal 73.5; 74.6; snout to insertion of pelvics 52.2; 53.4; length of longest ray of dorsal 25.3; 27.4; longest ray of pelvic 20.7; 18.1; longest ray of pectoral 21.2; 19.7; longest ray of anal 17.8; 18.1; longest ray of caudal 32.5; 31.5.

The following counts were made: Gill rakers on one paratype were 2+4 or 5; scale rows crossing lateral line 27; 28; 27; 28; 27; scales above lateral line always $4\frac{1}{2}$ and below lateral line (pelvic base to lateral line) always $2\frac{1}{2}$; scales around caudal peduncle always 12; scales in front of dorsal fin 10; 11; 10; 10; 10; dorsal rays always iii, 8; anal always iii, 5; pectoral 14–14; 15; pelvic always 8; pharyngeal teeth on one paratype 5:3:2–2:3:4.

Scales rather large, radiately striate; lateral line complete; two pair of barbels both of about same length and a little longer than eye; no parallel lines of minute pores on the head; mouth slightly inclined, subinferior, the snout projecting a little; groove of lower lip interrupted by a frenum at tip of chin; premaxillary protractile; interorbital space flattish; body somewhat compressed; pelvic insertion under the first branched ray of dorsal; caudal fin forked; posterior margin of dorsal and anal fins slightly concave; pectoral fin somewhat pointed;

rear edge of maxillary not quite reaching to under front margin of eye; pelvics not quite reaching to the anus and the pectorals not reaching to base of pelvics; snout rounded.

The most characteristic color mark is a single blackish oval spot, almost size of eye, at rear of caudal peduncle along midaxis covering the last three scales, but only the width of one scale along lateral line; tip of snout blackish; pigment over orbits more intense and on occiput; posterior margin of scales pigmented and those along lateral line intensely pigmented posteriorly but the lateral line divides this pigment into upper and lower spots to give the appearance of a double row of pigment spots along the lateral line; scales below lateral line not pigmented; a little black pigment at origin of dorsal and on some specimens the pigment is more distinct at each side of base of dorsal fin along the upper part of the back; base of anal fin with black pigment; some specimens show a black line along midaxis above lateral line; this fades posteriorly on caudal peduncle.

Remarks.—This new species differs from other species in the genus *Barbus* by having the large caudal spot in combination with 27 or 28 scales in lateral line; 12 scales around the caudal peduncle, 10 or 11 scales in front of the dorsal fin, among other characters.

Named *boboï* for one of the men who helped Dr. Mann collect fishes.

BARBUS ABLABES (Bleeker)

Puntius (Barbodes) ablabes BLEEKER, Nat. Verh. Vet. Haarlem, vol. 18, No. 2, p. 114, pl. 23, fig. 1, 1863.

Barbus ablabes STEINDACHNER, Notes Leyden, Mus., vol. 16, p. 79, 1894 (Hill Town, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 156, 1911 (Liberia).

U.S.N.M. No. 118734 contains 10 specimens, 28 to 57 mm., collected at Bellyella, by Dr. W. M. Mann.

BARBUS SPURRELLI Boulenger

Barbus spurrelli BOULENGER, Proc. Zool. Soc. London, p. 51, pl. 3, fig. 1, 1913.

U.S.N.M. No. 118735 contains 3 specimens, 32 to 55 mm., from Bellyella, collected by Dr. Mann.

Family SILURIDAE

ARTIFICIAL KEY TO THE SILURIDAE REPORTED FROM LIBERIA

- 1a. Dorsal and anal fins single, very long with articulated rays, but without spines; adipose dorsal absent; gill membranes free from the isthmus; eye with a free border; pectoral and pelvic fins present, well developed.
- 2a. Dorsal rays 82 to 89; anal 63 to 77 (see table for fin ray counts); dorsal and anal fins not actually joined to the caudal but no free space between them; depth 8 in standard length, 9 in total length; maxillary barbel reaches almost to tip of pectoral fin; nasal barbel reaches to upper edge of gill opening; about 8 to 10 branchiae or branchial branches in the accessory gill chamber.-----*Clarias salae* Hubrecht

2b. Anal rays usually fewer than 62.

3a. Dorsal rays 55; anal 50 (see table 3) --- *Clarias büttikoferi* Steindachner

3b. Dorsal rays 70 to 82 (74 in a specimen from Liberia); anal rays 52 to 63 (52 in a Liberian specimen); dorsal and anal fins not joined to caudal and with but little or no space between them; depth 6 or 7 in total length; maxillary barbel reaching past pectoral sometimes to pelvics; nasal barbel as long as head (after Boulenger).

Clarias angolensis Steindachner

3c. Dorsal rays 60 to 68 (64 to 66 in counts made on Liberian material); anal 48 to 55 (in Liberian material); depth $5\frac{1}{2}$ to 6 in standard length and $6\frac{1}{4}$ to $6\frac{3}{4}$ in total length; dorsal and anal not joined to caudal fin but with no free space between them; maxillary barbel reaches to near end of pectoral fin; nasal barbel reaches to rear of base of pectoral fin.

Clarias liberiensis Steindachner

1b. First dorsal fin if present very short, composed of but a few rays, or the dorsal fin is divided into two parts, the posterior adipose.

4a. A rayed dorsal fin absent, but an adipose fin present; anal short with 3 simple rays and 6 to 10 branched rays; gill membranes widely joined to the isthmus; adipose fin far back over the anal; pectoral, without spines, but with about 9 soft rays, the first simple, others branched; under the skin all over the body is an electric gland, whitish and jellylike; body and head blotched with blackish; a pale bar across caudal peduncle; central part of caudal fin blackish, the margin white.

Malapterurus electricus (Gmelin)

4b. A rayed dorsal fin and an adipose fin both present, these two fins separate; no electric gland under the skin; gill membranes free from isthmus, deeply notched.

5a. Dorsal fin is short, with a spine and 5 or 6 branched rays and a very small adipose fin, its base not longer than the base of two dorsal fin rays; body strongly compressed; the anal fin very long; caudal fin forked; eye with free border; pectoral with a spine.

6a. Maxillary barbel longer than outer mandibular barbel; anal rays 54 to 60; pectoral spine strongly serrated on inner side; nasal barbel not longer than eye; depth 3 to $4\frac{1}{2}$ in total length and head 5 or 6; a blackish obscure blotch on side above the pectoral fin (after Boulenger) ----- *Eutropius niloticus* (Rüppell)

6b. Maxillary barbel longer than outer mandibular barbel; anal rays 46 to 50; pectoral spine moderately serrated on inner side; nasal barbel not longer than eye; depth 4 to $4\frac{1}{2}$ and head 5 times in total length; a blackish blotch above pectoral fin.

Eutropius liberiensis Hubrecht

6c. Maxillary barbel not longer than outer mandibular barbel; anal rays 52 to 59; maxillary and nasal barbels of about same length, the nasal barbel a little longer than eye; depth $3\frac{3}{4}$ to $4\frac{1}{2}$ and head 5 to $5\frac{1}{2}$ in total length; inner edge of pectoral spine strongly serrated.

Eutropius mandibularis Günther

5b. Rayed or first dorsal fin base short, the length of the base of the adipose fin is longer than the length of the base of two dorsal rays.

7a. Length of base of adipose dorsal fin about same length as diameter of the eye; dorsal rays about I, 6; anal with 5 or 6 simple rays and 8 or 9 branched rays; nasal barbel present but short; maxillary barbel reaches a little past front base of pectoral; a small patch of teeth on head of palatines.

8a. Width of head at front of eye $1\frac{1}{4}$ times snout; length of nasal barbel not over $\frac{1}{2}$ eye; eye $4\frac{1}{2}$ in head and $1\frac{3}{4}$ in snout; first and second soft dorsal rays about length of head; inner edge of pectoral spines strongly serrated; lobes of caudal fin not long and pointed about length of head-----*Chrysichthys nigrodigitatus* (Lacepède)

8b. Width of head at front of eyes equal to length of snout; nasal barbel equal to $\frac{1}{2}$ eye; eye $3\frac{1}{2}$ in head and $1\frac{1}{4}$ in snout; first and second soft dorsal rays a little longer than the head and $1\frac{1}{2}$ longer than the dorsal spine; inner edge of pectoral spines strongly serrated; lobes of caudal fin long and pointed the upper lobe $\frac{1}{2}$ length of head.

Chrysichthys filamentosus Boulenger

7b. Length of base of adipose fin many times longer than eye diameter.

9a. Dorsal rays about 30 to 33; anal 41 to 52; adipose fin supported by prolongations of the neural spines; gill rakers 18 to 20; base of adipose fin as long as length of head and a little shorter than base of rayed dorsal; depth of body $5\frac{3}{4}$ to 6 in standard length and 6 to 7 in total length; nasal barbel reaches to opposite insertion of pectoral fin; maxillary barbel extends somewhat behind tips of pectoral fins; margins of anal, caudal, and dorsal fins white; body blackish above, white below.

Heterobranchius isopterus Bleeker

9b. Dorsal rays 7; without a spine.

10a. Adipose dorsal fin not continuous with the caudal fin; origin of dorsal fin a little in advance of insertion of pelvics; caudal fin with a wide black bar across its central portion; the basal third white and distally white; the skin at base of caudal fin rays extends posteriorly over the base of the caudal fin rays in the form of 6 or 7 dermal papillae or projections; eye very small, 4 in snout; depth $6\frac{1}{2}$ in standard length and 8 in total length; some specimens have 5 pale saddles dorsally, one over gill opening, the second in front of dorsal origin and another under base of dorsal; the fourth at origin of adipose and last at rear base of adipose fin; caudal fin concave; anal rays 9.

Amphilius pictus Nichols and LaMonte

10b. Adipose dorsal fin continuous with the caudal fin; origin of dorsal fin behind the base of the pelvic fins; caudal fin plain grayish, rounded; upper part of body pale brownish with small diffuse spots arranged in an irregular row on sides; pores of lateral line far apart; eye very small, about 5 in snout; depth about $7\frac{3}{4}$ to 8 in standard length and $9\frac{1}{4}$ in total length; anal rays 11-----*Paramphilius firestonei*, new species

Genus CLARIAS Scopoli

Clarias SCOPOLI, *Introductio ad historiam naturalem*, Prague, p. 455, 1777.

Clarias BLEEKER, *Systema silurorum revlsium*, Ned. Tijdschr. Dierk., vol. 1, p. [44] 120, 1863. (Type designated *Clarias morphus* Valenciennes=*C. batrachus* Linnaeus.)

CLARIAS SALAE Hubrecht

Clarias salae HUBRECHT, *Notes Leyden Museum*, vol. 3, p. 68, 1881 (St. Pauls River, Liberia).—BÜTTIKOFER, *Reisebilder aus Liberia*, vol. 2, p. 449, 1890

(Liberia).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 53, 1894 (St. Pauls, Junk, and Duqueah Rivers).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 264, 1911 (Liberia); vol. 4, p. 288, 1916 (Nanna Kru, Liberia).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 233, 1919 (St. Pauls River near Monrovia).—PELLEGRIN, Poiss. eaux douces Afr. Occid. p. 163, 1923 (Liberia).—NICHOLS and LA MONTE, Amer. Mus. Nov., No. 626, p. 2, 1933 (Kaleata, Liberia).

TABLE 3.—Fin ray counts made on various species of *Clarias* from Liberia after the skin was dissected to expose the bony elements of the fins

No.	Dorsal fin rays				Anal fin rays			
	<i>C. salae</i>	<i>C. angolensis</i> ¹	<i>C. liberiensis</i>	<i>C. buttkoferi</i> ²	<i>C. salae</i>	<i>C. angolensis</i> ¹	<i>C. liberiensis</i>	<i>C. buttkoferi</i> ²
48.							1	
49.							1	
50.							1	1
51.							1	
52.						1	2	
53.								
54.								
55.				1				
56.								
57.								
58.								
59.								
60.								
61.								
62.								
63.					1			
64.			1					
65.			4		1			
66.			1		2			
67.								
68.					3			
69.								
70.								
71.					4			
72.								
73.								
74.		1						
75.								
76.								
77.					1			
78.								
79.								
80.								
81.								
82.	1							
83.	3							
84.	2							
85.	1							
86.	1							
87.	1							
88.								
89.	3							

¹ Counts by Fowler, 1919.

² Counts by Steindachner, 1894.

The following specimens have been examined :

U.S.N.M. Nos. 48495-48498, 4 specimens, St. Pauls River, Mount Coffee, Liberia, Rolla P. Currie.

U.S.N.M. No. 118771, 10 specimens, 94 to 140 mm., Gibi Mountain, W. M. Mann.

U.S.N.M. No. 118772, 12 specimens, 86 to 210 mm., Bendaja, W. M. Mann.

U.S.N.M. No. 118773, 25 specimens, 110 to 278 mm., Bromley, W. M. Mann.

U.S.N.M. No. 118774, 24 specimens, 101 to 390 mm., Harbel, W. M. Mann.

U.S.N.M. No. 118775, 3 specimens, 92 to 169 mm., Bellyella, W. M. Mann.

M.C.Z., 1 specimen, 69 mm., Du Queah River, Liberia, July 1926, G. M. Allen.

M.C.Z., 1 specimen, 182 mm., Gbanga, Liberia, Sept. 26, 1926, G. M. Allen.

CLARIAS ANGOLENSIS Steindachner

Clarias angolensis STEINDACHNER, Verh. Zool. Bot. Ges. Wien, vol. 16, p. 766, pl. 13, figs. 4, 7, 1866.—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 232, 1919 (Monrovia).

It is very probable that an error was made in counting the fin rays of this 98 mm.-specimen, unless the skin was dissected from one side of the median fins. The specimen should be reexamined, since no further counts on any species of *Clarias* from Liberia have given 74 dorsal and 52 anal rays. Fowler's 1919 specimen may be *C. liberiensis*.

CLARIAS LIBERIENSIS Steindachner

Clarias liberiensis STEINDACHNER, Notes Leyden Museum, vol. 16, p. 54, 1894 (Buluma and Junk River).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 258, fig. 214, 1911 (Liberia).—PELEGRIN, Poiss. eaux douces Afr. Occid., p. 102, 1923 (Liberia).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

Clarias bulumae STEINDACHNER, Notes Leyden Mus. vol. 16, p. 55, 1894 (Buluma).

The variation in fin ray counts of this and other closely related species probably is caused by inaccurate counts. It is positively necessary, except in rare cases, to dissect the skin from one side of the median fins in order to count the rays. Thus it is likely that *Clarias büttikoferi* Steindachner is the same as *C. liberiensis*, and that Boulenger, 1911, p. 258, is in error in giving anal rays 44 or 45 when they actually are 48 to 55 on the Liberian material that I have studied.

The following material has been examined :

U.S.N.M. No. 118786, 3 specimens, 52-92 mm., Harbel, W. M. Mann.

U.S.N.M. No. 118787, 2 specimens, 116 and 117 mm., Bendaja, W. M. Mann.

U.S.N.M. No. 118788, 7 specimens, 69-91 mm., Gibi Mountain, W. M. Mann.

M.C.Z., 1 specimen, 42 mm., little stream of clearing at Firestone No. 3 plantation, Liberia, July 1926, G. M. Allen.

CLARIAS BÜTTIKOFERI Steindachner

Clarias büttikoferi STEINDACHNER, Notes Leyden Mus., vol. 16, p. 53, 1894 (Buluma, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, 261, 1911 (Liberia).—PELEGRIN, Poiss. eaux douces Afr. Occid. p. 164, footnote, 1923 (Liberia).

Genus **MALAPTERURUS** Lacepède

Malapterurus LACEPÈDE, Hist. Nat. Poiss., vol. 5, p. 90, 1803. (Type: *Malapterurus electricus* Lacepède.)

MALAPTERURUS ELECTRICUS (Gmelin)

Silurus electricus GMELIN, Syst. Nat., vol. 1, p. 1351, 1789.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 69, 1881 (St. Pauls River).—BÜTIKOFER, Reisebilder aus Liberia, vol. 2, p. 447, 1890 (Liberia).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 62, 1894 (St. Pauls River at Soforeh Place and Grand Cape Mt.).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 234, 1919 (Mt. Coffee near Monrovia).

The following specimens have been examined:

U.S.N.M. No. 44829, 1 specimen, Liberia, O. F. Cook.

U.S.N.M. Nos. 48492, 48493, 2 specimens, St. Pauls River, Mount Coffee, Rolla P. Currie.

U.S.N.M. No. 118776, 2 specimens, 36 to 77 mm., Harbel, W. M. Mann.

U.S.N.M. No. 118777, 8 specimens, 59 to 153 mm., Bendaja, W. M. Mann.

U.S.N.M. No. 118778, 4 specimens, 82 to 130 mm., Bromley, W. M. Mann.

U.S.N.M. No. 118779, 5 specimens, 75 to 100 mm., Gibi Mountain, W. M. Mann.

M.C.Z., 1 specimen, 170 mm., St. Pauls River, Pea'htah and vicinity, October 1926, D. H. and G. M. Linden.

Genus **EUTROPIUS** Müller and Troschel

Eutropius MÜLLER and TROSCHER, Horae Zool. Beschreibung und Abbild. neuer Fische, vol. 3, p. 6, 1849. (Type: *Hypophthalmus niloticus* Rüppell.)

EUTROPIUS NILOTICUS (Rüppell)

Hypophthalmus niloticus RÜPPEL, Beschr. neuer Fische Nil, p. 6, pl. 1, fig. 1, 1829.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 69, 1881 (St. Pauls River).

Eutropius altipinnis STEINDACHNER, Notes Leyden Mus., vol. 16, p. 57, 1894 (St. Pauls River at Soforeh Place).

EUTROPIUS LIBERIENSIS Hubrecht

Eutropius liberiensis HUBRECHT, Notes Leyden Mus. vol. 3, p. 69, 1881 (St. Pauls River, Liberia).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 59, 1894 (St. Pauls River).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 287, 1911 (Liberia).

EUTROPIUS MANDIBULARIS Günther

Eutropius mandibularis GÜNTHER, Ann. Mag. Nat. Hist., ser. 3, vol. 20, p. 112, 1867.—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 57, 1894 (Farmington River, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 290, 1911 (Farmington River, Liberia).

Genus **CHRYSICTHYS** Bleeker

Chrysiichthys BLEEKER, De visschen van den Indischen Archipel. I. Siluri, p. 60, 1858. (Type: *Pimelodus auratus* Geoffroy St. Hilaire.)

CHRYSICTHYS NIGRODIGITATUS (Lacepède)

Pimelodus nigrodigitatus LACEPÈDE, Hist. Nat. Poiss., vol. 5, pp. 102, 108, 1808.

Chrysichthys nigrodigitatus HUBRECHT, Notes Leyden Mus., vol. 16, p. 59, 1804 (St. Pauls River at Soforeh Place).—BOULENGER, Cat. fresh-water fishes Africa, vol. 2, p. 321, 1911 (Senegal to Ogowe).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 233, 1919 (St. Pauls River near Monrovia).

Chrysichthys büttikoferi STEINDACHNER, Notes Leyden Mus., vol. 16, p. 60, 1804 (Fischermann See).

The following specimens have been examined:

U. S. N. M. No. 48494, 1 specimen, St. Pauls River, Mount Coffee, R. P. Currie.

U. S. N. M. No. 118780, 3 specimens, 140 to 165 mm., Bendaja, W. M. Mann.

CHRYSICTHYS FILAMENTOSUS Boulenger

Chrysichthys filamentosus BOULENGER, Ann. Mus. Congo, vol. 2, p. 19, pl. 18, fig. 2, 1912 (type locality, Chiloango).

The United States National Museum collections contain 1 specimen, U. S. N. M. No. 118781, 133 mm., collected at Harbel by Dr. Mann.

Genus HETEROBRANCHUS Geoffroy St. Hilaire

Heterobranchus GEOFFROY ST. HILAIRE, Suite Hist. Poiss. Nil, p. 305, 1827. (Type: *H. bidorsalis* Geof. St. Hilaire.)

HETEROBRANCHUS ISOPTERUS Bleeker

Heterobranchus isopterus BLEEKER, Nat. Verh. Wet. Haarlem, vol. 18, p. 108, pl. 22, fig. 1, 1863.—PELLEGRIN, Poiss. eaux douces Afr. Occid. p. 168, 1923 (? bassin du Haut—Saint Paul).

I have examined the following specimens:

U.S.N.M. No. 118806, 1 specimen, 121 mm., Bellyella, W. M. Mann.

U.S.N.M. No. 118807, 6 specimens, 150 to 325 mm., Bromley, W. M. Mann.

M.C.Z., 10 specimens, 31 to 42 mm., Gbanga, Liberia, G. M. Allen.

Genus AMPHILIUS Günther

Amphilius GÜNTHER, Cat. Fish. British Mus., vol. 5, p. 115, 1864. (Type: *Pimelodus platyichir* Günther.)

AMPHILIUS PICTUS Nichols and La Monte

Amphilius pictus NICHOLS and LA MONTE, Amer. Mus. Novitates No. 626, p. 1, 1933. (Types: From Kaleata, Liberia.)

The National Museum collections contain the following specimens:

U.S.N.M. No. 118877 (paratype), 1 specimen, Kaleata, Feb. 1932, G. W. Harley.

U.S.N.M. No. 118808, 1 specimen, 43 mm., Harbel, W. M. Mann.

U.S.N.M. No. 118809, 70 specimens, 35 to 56 mm., Bromley, W. M. Mann.

U.S.N.M. No. 118810, 16 specimens, 30 to 47 mm., Gibi Mountain, W. M. Mann.

PARAMPHILIUS Pellegrin

Paramphilius PELLEGRIN, Bull. Mus. Hist. Nat. Paris, vol. 13, p. 23, 1907. (Type: *P. trichomycteroides* Pellegrin.)

PARAMPHILIUS FIRESTONEI, new species

PLATE 36, FIGURE 3

Holotype.—U.S.N.M. No. 118811, 56 mm. standard length, collected at Bromley, Liberia, by Dr. Wm. M. Mann.

Paratypes.—U.S.N.M. No. 118812, 29 specimens, 38 to 61 mm. standard length, same collection data as the type; U.S.N.M. No. 118813, 1 specimen, 49 mm. standard length, taken at Harbel by Dr. Mann.

Description.—Based on the holotype and 30 paratypes. All measurements are given in hundredths of the standard length, those for the holotype outside the parentheses and those for two paratypes within parentheses, respectively.

Total length in mm. 64 (69.2; 45); and standard length 56 (58.6; 38) in mm. Length of head 21.4 (20.1; 21.6); greatest depth 10.7 (14.7; 10.5); length of snout 7.14 (6.82; 7.1); diameter of eye 1.25 (1.37; 1.32); length of postorbital part of head 14.3 (13.3; 14.5); width of interorbital space 6.25 (6.0; 6.3); length of maxillary barbel 17.9 (19.6; 18.4); length of outer mandibular barbel 20.5 (23.9; 22.4); length of inner mandibular barbel 12.7 (14.5; 11.9); length of base of adipose dorsal fin 25 (19.6; 25.0); length of base of first dorsal fin 6.25 (5.8; 6.6); length of base of anal fin 12.5 (11.3; 12.6); distance from tip of snout to origin of first dorsal 50.1 (51.6; 49.7); distance from snout to origin of adipose dorsal 73.2 (77.6; 75.0); distance from snout to insertion of pelvic fin 46.1 (46.8; 45.2); distance from snout to insertion of pectoral fin 18.9 (17.6; 16.6); distance from snout to origin of anal fin 69.6 (70.2; 68.4); length of caudal peduncle 18.7 (17.6; 18.4); least depth of caudal peduncle 9.3 (8.2; 8.4); longest ray of dorsal fin 12.9 (11.9; 11.9); longest ray of anal fin 11.6 (13.7; 11.9); longest ray of pectoral fin 11.8 (11.9; 13.7); longest ray of pelvic fin 13.0 (12.5; 13.2); longest ray of caudal fin 16.1 (19.1; 17.9); dorsal rays 7 (7; 7); anal rays 12 (11; 12) first 5 simple; pectoral rays 7 (7; 7) first heavy and simple; gill rakers 3 on lower half of first gill arch.

Top of head depressed; mouth terminal, the lower jaw a trifle shorter than upper; gill membranes free from the isthmus deeply notched or extending far forward; cheeks swollen; eyes very small; maxillaries not reaching to under eyes; nasal openings widely separated without barbels; adipose fin continuous with the caudal fin; origin of dorsal fin a little behind a vertical through the rear base of the pelvic fin; anus located a little behind pelvic fin bases, about one head length in front

of anal origin; caudal fin a little rounded; lateral line present, the pores widely spaced and numbering about 11 to 17.

Color pale brown above, lighter below; upper parts of body with several small dark brown to blackish spots irregularly placed, usually a spot near mid-base of caudal fin and a dark bar across caudal fin a short way out from base of that fin; adipose fin dark brown; basal portion of dorsal fin dusky; other fins pale or white; barbels pale brown.

Remarks.—This new species differs principally from the only other species, *P. trichomycteroides* Pellegrin, referred to the genus *Paranphilius* in its more slender body, depth $8\frac{1}{2}$ to 9 instead of 7, and the origin of the dorsal is behind the base of the pelvic fins instead of over their insertion.

Named *freestonei* in honor of the Smithsonian-Firestone Expedition, by which the collection of this material was made possible.

Family CYPRINODONTIDAE

KEY TO THE GENERA AND SPECIES OF CYPRINODONTIDAE REPORTED FROM LIBERIA

1a. The membrane connecting upper and lower lips is joined to the lower lip on the same general level as front margin of lower lip and not below the posterior angle of lower lip; lower lip curved upward, the contour of lower jaw from lateral aspect rounded; snout short, about $1\frac{1}{2}$ in postorbital length of head, and $1\frac{1}{2}$ to 2 in interorbital space.

2a. Dorsal rays 12 or 13; anal 15 to 16; scales 30 to 32; origin of dorsal fin over 4 to 6 anal rays; pectoral rays about 16 to 18; gill rakers on lower half of first arch about 11; pelvics short, not reaching anal fin and contained $1\frac{1}{4}$ to $1\frac{1}{2}$ in postorbital part of head; eye contained $1\frac{1}{2}$ in interorbital space and $2\frac{1}{2}$ in postorbital part of head; depth 6 to $6\frac{1}{3}$ in total length; upper base of caudal fin with a blackish speck or spot on females, obscured on males because of dark color; fins blackish on breeding males, pale and spotted on females; lower edge of caudal of males pale.-----*Aphyosemion liberiensis* (Boulenger)

2b. Dorsal rays 7 to 10; anal 10 to 13.

3a. Pectoral rays 16 to 18; dorsal rays 9 or 10; anal 12 or 13; scales 29 or 30; depth $3\frac{1}{2}$ to $4\frac{1}{3}$ and head $3\frac{1}{3}$ to $3\frac{2}{3}$ times in total length; eye $3\frac{2}{3}$ to 4 times in head and two in interorbital space; olive or brownish above, yellowish white below, sides with carmine spots, more or less arranged in lengthwise streaks (after Boulenger).

-----*Aphyosemion calliurus* (Boulenger)

3b. Pectoral rays 10 or 11; dorsal rays 7; anal 10 or 11; scales 22 or 23; origin of dorsal over the 4th or 5th anal ray; gill rakers about 12 to 14; a fine black line along mid-axis. Color.—Plain.

-----*Micropanchax macrurus manni*, new subspecies

1b. The membrane connecting upper and lower lips is joined to the lower lip considerably below the angle at posterior part of lower lip and below the general level of the lip anteriorly; lower lip but slightly curved upward giving a pointed aspect to snout when viewed from the side; snout longer, contained about 1 to $1\frac{1}{2}$ in postorbital part of head and 1 to $1\frac{1}{2}$ in interorbital space.

4a. Six or seven black color bars mostly below lateral line.

5a. Seven vertical blackish bars, more intense ventrally, the first on rear of head; second under pectoral fin; third close before pelvic base; fourth through anus; fifth through middle of base of anal fin at about 9th to 11th rays; sixth on caudal peduncle just behind dorsal fin base; and last at base of caudal fin rays; blackish under eye, and sides of lower jaw and lips; dorsal rays usually 10; anal 16 or 17; pectoral 16; scales 28 or 29.

Epiplatys sexfasciatus Gill

5b. Six vertical black bars on each side, first on the gill-cover; second under pectoral (none at base of pelvics) one through anus; one through middle of the anal fin; the fifth behind base of dorsal on caudal peduncle; and last at base of caudal fin; only last one or two extending to upper part of body. Color.—Somewhat reddish, males said to have red chins. Anal rays 15 or 16, dorsal rays usually 10; scales 25 to 27; depth about 4 in standard length, 5 in total length.

Epiplatys chaperti (Sauvage)

4b. Color not as in 4a.

6a. Dorsal rays 7 to 9.

7a. Anal 13 or 14; scales 26 or 27; depth 3 or 4 in total length and head $3\frac{1}{2}$ to $3\frac{3}{4}$; eye equals postorbital part of head and $\frac{1}{2}$ interorbital space; male with numerous more or less distinct vertical bars-----*Epiplatys spilauchen* (A. Duméril)

7b. Anal 16 or 17; scales 27 to 29; pectoral rays about 16; origin of dorsal over the 11th or 12th anal ray; gill rakers on lower half of first arch 9 to 11; length of pelvics equal to distance from front of eye to rear of head; depth of caudal peduncle is $\frac{1}{2}$ in its length measured from base of last anal rays to base of middle ray of caudal fin; caudal fin pointed, the middle rays $1\frac{1}{3}$ times head; snout equals postorbital part of head and interorbital space; eye $1\frac{1}{3}$ in snout and $1\frac{1}{3}$ in interorbital space; brownish band along lower sides from eye to caudal fin base, ventrally yellowish, above band a narrow pale streak. The upper sides and back brownish; each scale on middle and upper sides with a scarlet narrow crescent-shaped spot; fins dusky; dorsal with reddish spots; under side of lower lip reddish; base of anal blackish.

Epiplatys bifasciatus (Steindachner)

6b. Dorsal rays 11 to 13; anal 16 to 18; pectoral 17 or 18; scales 28 or 29; origin of dorsal over 7th to 9th anal rays; about 10 or 11 gill rakers on lower half of first arch; eye $1\frac{1}{2}$ in interorbital and $1\frac{1}{2}$ in snout; snout $1\frac{1}{2}$ in interorbital and $1\frac{1}{2}$ in postorbital part of head; depth $5\frac{1}{2}$ in total length-----*Epiplatys fasciolatus* (Günther)

Genus APHYOSEMION Myers

Aphyosemion MYERS, Amer. Mus. Nov. No. 116, p. 2, 1924. (Type: *Aphyosemion castaneum* Myers.)

APHYOSEMION LIBERIENSIS (Boulenger)

Haplochilus liberiensis BOULENGER, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 30, 1908 (Monrovia, 2 female types).—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 48, fig. 35, 1915 (Monrovia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 229, 1923 (Monrovia).

The following specimens have been examined:

U.S.N.M. No. 118846, 2 specimens, 32 and 35 mm., Bromley, Dr. W. M. Mann.
M.C.Z., 20 specimens, 17 to 40 mm., Du River, Liberia, Firestone No. 3 Plantation, July 1926, G. M. Allen.

APHYOSEMION CALLIURUS (Boulenger)

Haplochilus calliurus BOULENGER, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 265, 1911 (types from Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 59, fig. 45, ♂ and ♀ types, 1915 (Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 233, 1923 (Liberia).

Genus MICROPANCHAX Myers

Micropanchax MYERS, Copela, No. 129, p. 42, 1924. (Type: *Haplochilus schoellerti* Boulenger.)

MICROPANCHAX MACRURUS MANNI, new subspecies

PLATE 36, FIGURE 4

Holotype.—U.S.N.M. No. 118851, 20.3 mm. standard length (total length 28.3 mm.), collected by Dr. W. M. Mann at Harbel, Liberia.

Paratypes.—U.S.N.M. No. 118852, 4 specimens, 15.0 to 21.5 mm. standard length, same collection data as holotype.

Description.—Based on the holotype and 4 paratypes. All measurements are expressed in hundredths of the standard length, those for the holotype first, then followed by those for the paratypes in parentheses, respectively. Standard lengths (in mm.) 20.3 (18.5; 21.5; 17.0) and total lengths (in mm.) 28.3 (24.5; 28.6; 23.3); greatest depth of body 26.1 (25.4; 23.7; 24.6); length of head 29.5 (28.6; 27.9; 28.2); diameter of eye 13.3 (12.4; 12.6; 11.8); width of bony interorbital space 14.3 (11.9; 12.1; 13.5); length of snout 7.4 (6.5; 7.0; 7.6); length of caudal peduncle or distance from base of last anal ray to base of midcaudal fin rays 28.1 (26.5; 25.1; 27.7); least depth of caudal peduncle 16.7 (15.1; 15.3; 17.1); length of postorbital part of head 10.3 (9.7; 9.3; 10.0); length of base of anal fin 15.8 (13.0; 16.3; 15.9); length of base of dorsal fin 7.9 (8.1; 8.8; 9.4); distance from tip of snout to origin of dorsal fin 65.5 (69.2; 68.4; 65.9); snout to origin of anal fin 63.1 (62.2; 61.4; 58.3); snout to insertion of pelvic fins 42.2 (42.2; 41.4; 41.8); snout to insertion of pectoral fins 29.1 (27.6; 28.4; 31.2); length of longest ray of pelvic fins 21.6 (—; 16.3; 18.8); length of longest ray of pectorals 29.5 (—; —; —).

The following counts were made: Dorsal rays 7 (7; 7; 7); anal rays 10 (10; 11; 11); pectoral rays 10 (11; 11; 11); pelvic rays 6 (6; 6; 6); number of scale rows from upper edge of gill opening to base of caudal fin 23 (22; 23; 23); number of scales around body at origin of dorsal fin 13 (13; 13; 14); number of scales around caudal peduncle 12 (11; 11; 12).

Color plain, with a narrow black line along midaxis; upper part of head blackish, fins dusky, the last rays of dorsal and anal fins elongate; caudal fin a little rounded; interorbital space bony and rather wide; snout short, the lower lip somewhat curved over tip of snout; teeth in jaws in two or three rows, the outer ones enlarged; probably no teeth on vomer; the membrane of upper lip joins the lower lip at the lateral posterior angle of the lower jaw which is on the same general level as front of lower lip and not below it, as in *Aplocheilus*.

This new subspecies of *Micropanchax* differs from *M. macrurus macrurus* in having 22 or 23 scales and 10 or 11 anal rays instead of 24 to 27 and 12 to 14, respectively. The small number of pectoral rays 10 or 11 appears to be an outstanding difference when compared with other cyprinodonts from West Africa. Unfortunately the pectoral rays of several species are not recorded but the usual number appears to be 15 to 18.

Named in honor of Dr. William M. Mann, director of the National Zoological Park, collector of the subspecies.

Genus EPIPLATYS Gill

Epiplatys GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 136. (Type: *Epiplatys sexfasciatus* Gill.)

EPIPLATYS SEXFASCIATUS GILL

Epiplatys sexfasciatus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 136.

Haplochilus infrafasciatus STEINDACHNER, Notes Leyden Mus., vol. 16, p. 76, 1894 (Junk River, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 54, fig. 40, 1915 (Nanna Kru, Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 231, 1923 (Liberia to Congo).

EPIPLATYS SPILAUCHEN (Duméril)

Poecilia spilauchena DUMÉRIL, Arch. Mus., vol. 10, p. 258, pl. 22, fig. 6, 1859.

Haplochilus spilauchen STEINDACHNER, Notes Leyden Mus., vol. 16, p. 75, 1894 (Robertsport, Liberia).

EPIPLATYS BIFASCIATUS (Steindachner)

Haplochilus bifasciatus STEINDACHNER, Sitz. Akad. Wiss. Wien, vol. 83, pt. 1, p. 199, 1881.

Dr. Mann collected the following specimens:

U.S.N.M. No. 118848, 22 specimens, 30 to 43 mm., Harbel.

U.S.N.M. No. 118849, 7 specimens, 38 to 46 mm., Bromley.

U.S.N.M. No. 118850, 8 specimens, 26 to 40 mm., Bendaja.

EPIPLATYS FASCIOLATUS (Günther)

Haplochilus fasciolatus GÜNTHER, Cat. fishes Brit. Mus., vol. 6, p. 358, 1866 (types a-e, Sierra Leone).—NICHOLS and LAMONTE, Amer. Mus. Nov., No. 626, p. 2, 1933 (Kaleata, Liberia).

Aplocheilus spilauchen FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 241, 1919 (St. Pauls River).

The following specimens have been examined:

- U.S.N.M. No. 48522, 20 specimens, 26 to 63 mm., St. Pauls River (from a creek), R. P. Currie.
 U.S.N.M. No. 48523, 6 specimens, 37 to 53 mm., St. Pauls River (from a creek), R. P. Currie.
 U.S.N.M. No. 48524, 3 specimens, 49 to 55 mm., St. Pauls River (from a creek), R. P. Currie.
 U.S.N.M. No. 118841, 67 specimens, 21 to 66 mm., Gibi Mountain, 900 feet elevation, W. M. Mann.
 U.S.N.M. No. 118842, 6 specimens, 24 to 39 mm., Bellyella, W. M. Mann.
 U.S.N.M. No. 118843, 68 specimens, 28 to 64 mm., Bromley, W. M. Mann.
 U.S.N.M. No. 118844, 13 specimens, 31 to 58 mm., Bendaja, W. M. Mann.
 U.S.N.M. No. 118845, 7 specimens, 31 to 53 mm., Harbel, W. M. Mann.
 M.C.Z., 19 specimens, 14 to 47 mm., Du River, Firestone Plantation No. 3, July 1926, G. M. Allen.

EPIPLATYS CHAPERI (Sauvage)

Haplochilus chapcri SAUVAGE, Bull. Soc. Zool. France, p. 323, pl. 5, fig. 5, 1882.—BOULENGER, Fresh-water fishes Africa, vol. 3, p. 56, fig. 41, 1914 (Liberia).

The National Museum collections contain the following specimens:

- U.S.N.M. No. 47751, 1 specimen, 22 mm., Monrovia.
 U.S.N.M. No. 118847, 1 specimen, 24 mm., Harbel, about 40 miles inland from Monrovia.

Family CICHLIDAE

KEY TO THE CICHLIDS OF LIBERIA (SEE TABLE 4)

- 1a. Teeth simple in one or more rows, the inner row or rows sometimes irregular, or absent.
- 2a. No fleshy pad or swelling at anterior base of upper half of first gill arch; a few canines at tip of upper jaw; single inner row of teeth, sometimes irregular; gill rakers simple.
- 3a. Dorsal rays XIII or XIV, 9 to 11; anal III, 7 or 8; gill rakers 2 or 3+7 or 8; scales 24 to 27, $3\frac{1}{2}$ above lateral line and 9 below it; 4 rows of scales on cheek; the greatest width of naked area on preopercle 6 to 8 in postorbital part of head; the latter is contained 0.8 time in depth of caudal peduncle; least depth of caudal peduncle equals its length from base of anal to midbase of caudal fin rays; about 9 scales in posterior lateral line; the latter about 1.9 in the head; a black opercular spot and two other large black spots on sides; the last at base of caudal fin rays; sometimes lengthwise rows of small spots anteriorly on head and back.

***Hemichromis bimaculatus* Gill**

- 3b. Dorsal rays XIII-XV, 11 or 12; anal rays III, 8 or 9; gill rakers 3 to 5+7 or 8; scales 28 or 29, 4 from origin of spiny dorsal to lateral line, and 9 from origin of anal fin to anterior lateral line; 5 rows of scales on the cheek; the greatest width of naked area on preopercle contained 5 to 6 times in the postorbital part of the head; postorbital part of head equals depth of caudal peduncle, and the latter is contained $1\frac{1}{4}$ times in its length; about 11 scales in posterior lateral line; the latter contained $1\frac{1}{4}$ to $1\frac{1}{2}$ in the head; 5

blackish bars on body; young with a black lateral band connecting the black bars; these black bars more intense along midaxis, almost forming black blotches in adults.-----*Hemichromis fasciatus* Peters

- 2b. A fleshy pad at anterior upper base of first gill arch; no canines at front of jaws; 3 or 4 scale rows on cheeks.

- 4a. About 28 scales in the lower lateral line, its length $1\frac{1}{2}$ times longer than the head; scales about 38, 8 or 9 from origin of dorsal to upper lateral line and 10 from anal origin to upper lateral line; 2 or 3 scales between lateral lines at front of lower lateral line; several rows of teeth behind the outer row; dorsal rays XIV, 17; anal III, 9; gill rakers simple, about 10+14; pectoral fin with 15 rays, very long $2\frac{1}{3}$ in standard length; least depth of caudal peduncle 1.3 in its length. Color—Consisting of lengthwise streaks on body; dorsal and anal mottled.

Pelmatochromis jentinkii (Steindachner)

- 4b. About 7 to 10 scales in the lower posterior lateral line; scale rows about 27 to 30; 3 to $3\frac{1}{2}$ scales from origin of dorsal fin to upper lateral line and 8 or 9 scales from origin of anal to upper lateral line; postorbital part of head about 1 to $1\frac{1}{2}$ in depth of caudal peduncle.

- 5a. Scale rows 27 or 28; least depth of caudal peduncle about 0.9 time in its length; gill rakers simple on first arch 4 to 6+8; several rows of teeth within the outer row; length of posterior lateral line about $\frac{1}{2}$ length of head and with about 8 scales; greatest width of naked area on cheek about 3 times in postorbital length of head; dorsal rays XIV-XV, 11 or 12, anal usually III, 8; color pattern of 7 blackish bars with a large blackish blotch in the 5th under the last spines and first soft rays of dorsal fin; black opercular spot; caudal fin not barred.-----*Pelmatochromis büttikoferi* (Steindachner)

- 5b. Scale rows about 30; least depth of caudal peduncle about 1.2 to 1.3 in its length from base of last anal ray to midbase of caudal fin; length of posterior lateral line $\frac{1}{2}$ to $\frac{3}{4}$ length of head and with about 8 scales; no teeth behind outer row or not more than one irregular row; gill rakers branched 5 to 7+9 to 11; dorsal rays XVII to XVIII, 9 to 11; anal III, 7. Color of males.—Dorsal fin with 2 or 3 black and white bars, more or less extending in the same direction as the fin rays; body with about 8 indistinct bars or an indistinct band along midaxis; black opercular spot; outer rays of pelvics blackish and pelvics elongate in specimens over 50 mm. standard length, usually equal to or $1\frac{1}{2}$ times length of head; upper rays of caudal mottled with blackish. Color of females.—Margin of dorsal black otherwise median fins plain; pelvics entirely black, shorter than head; upper half of body brown with a purplish brown bar between anus and base of pelvics and extending obliquely backward toward end of spiny dorsal and first soft rays but fusing with color of upper half of body.-----*Pelmatochromis humilis* Boulenger

- 5c. Scale rows 26 to 28; least depth of caudal peduncle 1.0 in its length; gill rakers 3 to 5+7 or 8; posterior lateral line $\frac{1}{2}$ to $\frac{3}{4}$ length of head with 7 or 8 scales; greatest width of naked area on cheek about 3.9 to 4 times in postorbital length of head; dorsal rays XV, 10 or 11 (usually 11); anal III, 7 or 8. Color.—Caudal fin barred with about 10 narrow black bars crossing it; posteriorly dorsal and anal somewhat barred; sides of body with 7 or 8 blackish bars that sometimes join to form a lengthwise blackish band along midaxis,

and in other specimens the bars continue farther ventrally without a black lateral streak.....*Pelmatochromis caudifasciatus* Boulenger

- 1b. Teeth in outer row all bifid; several inner rows, of multifid teeth; no swelling or pad at base of gill arches.

6a. Gill rakers simple, 5 or 6+22 to 24 on first gill arch; dorsal rays XV or XVI, 13; anal III, 12; 2 rows of scales on the cheeks; greatest width of naked area of the preopercle $2\frac{1}{4}$ to $2\frac{1}{2}$ times postorbital part of head; scales 29 or 30, 3 above lateral line (origin of dorsal to upper line) and about 10 below upper lateral line (origin of anal to upper lateral line); postorbital part of head $1\frac{1}{2}$ in least depth of caudal peduncle; the latter 0.8 time in its length; 10 scales in lower lateral line, the latter about 1.3 times in the head; mouth small, not reaching to below eye and barely past nostril; pectoral fin a little longer than head. Color.—Plain light brownish; trace of pale mottlings in soft dorsal fin; pelvics white; median fins dusky; 4 or 5 faint and diffuse bars can be seen on some specimens more distinct in the young.....*Tilapia pleuromelas* Duméril

- 6b. Fewer than 18 gill rakers on lower limb of first gill arch.

7a. Cheeks with 5 or 6 rows of rather small scales, the width of the naked area is contained about 3 times in the postorbital part of the head; 8 brown color bars the first through eye and last two on caudal peduncle; color bars more or less extend on median fins; a wide bar across middle of caudal fin; dorsal rays XIV or XV, 15 to 17; anal III, 11; gill rakers 3+10 to 12; scales 29 or 30, 4 above and 9 below upper lateral line; least depth of caudal peduncle 6.8 in length of caudal peduncle; postorbital part of head 1.0 to 1.2 times in least depth of caudal peduncle; about 12 scales in lower lateral line, its length about 1.2 in the head; the 6th color bar forms a blackish spot at front base of soft dorsal; a blackish opercular spot present.

Tilapia büttikoferi (Hubrecht)

- 7b. Cheeks with 3 or 4 rows of scales.

8a. Dorsal rays XV, 10 or 11; anal III, 8; gill rakers 4+8 or 9; scales about 28, 3 above and 8 below the lateral line; 3 rows of scales on the cheek; postorbital part of head 1.1 times in least depth of caudal peduncle; the latter equal to its length; 10 scales in lower lateral line, and its length 1.3 in the head; about 9 obscure color bars and an indistinct blackish lateral band; near front of base of soft dorsal an ocellated black blotch; outer rays of pelvics blackish; caudal and soft dorsal fins mottled pale white and pale blackish; under side of head blackish, or with one or two blackish areas on mandible or on isthmus; rays of anal blackish distally; a black opercular spot.

Tilapia zillii (Gervais)

- 8b. Dorsal rays XV or XVI, 13 or 14; anal III, 9 to 11.

9a. Dorsal rays XV or XVI, 14; anal 9 to 11; gill rakers, 5 or 6+9 to 11; scales 27 to 29, 3 to $3\frac{1}{2}$ above and 9 or 10 below lateral line; 4 rows of scales on cheeks, width of naked area $2\frac{1}{2}$ times in postorbital part of head; depth of body $2\frac{1}{10}$ in standard length; postorbital part of head 1.6 in least depth of caudal peduncle, the latter 0.7 in length of caudal peduncle; 12 scales in lower lateral line. Color.—Center of each scale brownish; dorsal fin with bars and a blackish blotch at front of base of soft dorsal; a blackish opercular spot; young with 9 color bars, those under spinous dorsal fin sometimes double.....*Tilapia melanopleura* Duméril

- 9b. Dorsal rays XVI, 13; anal III, 9; gill rakers 4+13 or 14; scales 29 to 31; $3\frac{1}{2}$ above and 8 below lateral line; 3 or 4 rows of scales across the cheek; width of naked area 3 times in postorbital part of head; postorbital part of head 1.2 in least depth of caudal peduncle; the latter equal to length of caudal peduncle; 10 scales in lower lateral line; the latter contained 1.5 times in the head; depth of body $2\frac{1}{2}$ in standard length. Color.—Consisting of 9 bars and a blackish lateral band; dorsal mottled with pale, and a blackish blotch near front base of soft dorsal; a blackish opercular blotch-----Tilapia savagei Fowler

Genus HEMICHROMIS Peters

Hemichromis PETERS, Monatsb. Akad. Wiss. Berlin, 1857, p. 403. (Type: *H. fasciatus*.)

HEMICHROMIS BIMACULATUS GILL

Hemichromis biamaculatus GILL, Proc. Acad. Nat. Sci. Philadelphia, 1862, p. 137.—STEINDACHNER, Notes Leyden Mus. vol. 16, p. 49, 1894 (Junk, Sulymak, and Duqueah Rivers; Fischermann See).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 246, 1919 (St. Pauls River and Mount Coffee, Liberia).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

The following specimens have been examined:

U.S.N.M. No. 48489, 1 specimen, Mount Coffee, Monrovia, O. F. Cook and G. N. Collins.

U.S.N.M. No. 48506, 4 specimens, from a creek, St. Pauls River, Mount Coffee, Rolla P. Currie.

U.S.N.M. No. 48507, 2 specimens, from a creek, St. Pauls River, Mount Coffee, Rolla P. Currie.

U.S.N.M. No. 40508, 3 specimens, from a creek, St. Pauls River, Mount Coffee, Rolla P. Currie.

U.S.N.M. No. 118832, 36 specimens, 39 to 87 mm., Bromley, Wm. M. Mann.

U.S.N.M. No. 118833, 7 specimens, 30 to 84 mm., Bendaja, Wm. M. Mann.

U.S.N.M. No. 118834, 25 specimens, 25 to 93 mm., Harbel, Wm. M. Mann.

U.S.N.M. No. 118835, 64 specimens, 19 to 91 mm., Gibi Mountain, Wm. M. Mann.

M.C.Z., 11 specimens, 20 to 65 mm., Du River, G. M. Allen.

HEMICHROMIS FASCIATUS Peters

Hemichromis fasciatus PETERS, Monatsb. Akad. Wiss. Berlin, 1857, p. 403.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 68, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 47, 1894 (Junk and St. Pauls Rivers).—BOULENGER, Cat. fresh-water fishes Africa. vol. 3, p. 428, fig. 293, 1915 (Nanna Kru, Liberia).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 246, 1919 (St. Pauls River).—NICHOLS and LAMONTE, Amer. Mus. Nov. No. 626, p. 2, 1933 (Kaleata, Liberia).

The following specimens have been examined:

U.S.N.M. No. 48509, 1 specimen, St. Pauls River, Rolla P. Currie.

U.S.N.M. No. 118826, 1 specimen, 48 mm., Gibi Mountain, Wm. M. Mann.

U.S.N.M. No. 118828, 4 specimens, 51 to 110 mm., Bellyella, Wm. M. Mann.

U.S.N.M. No. 118829, 107 specimens, 16 to 127 mm., Bendaja, Wm. M. Mann.

U.S.N.M. No. 118830, 25 specimens, 18 to 150 mm., Bromley, Wm. M. Mann.

U.S.N.M. No. 118831, 241 specimens, 11 to 168 mm., Harbel, Wm. M. Mann.

M.C.Z., 1 specimen, 69 mm., Gbanga, G. M. Allen.

M.C.Z., 38 specimens, 8 to 48 mm., Du River, G. M. Allen.

Genus PELMATOCHROMIS Steindachner

Pelmatochromis STEINDACHNER, Notes Leyden Mus., vol. 16, p. 40, 1894. (Type: *Paratilapia büttikoferi* Steindachner.)

PELMATOCHROMIS JENTINKII (Steindachner)

Paratilapia (Pelmatochromis) jentinkii STEINDACHNER, Notes Leyden Mus., vol. 16, p. 43, pl. 2, fig. 1, 1894 (Fischermann Sec, Buluma).—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 383, fig. 259, 1915 (Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 269, 1933 (Liberia).

The number of scales between the lateral lines is variable, either 2 or 3, and I fail to locate the differences mentioned by Boulenger between *P. jentinkii* and *P. intermedius*, so I refer the latter to the synonymy of *jentinkii*.

The National Museum collections contain 2 specimens, U.S.N.M. No. 118827, 119 and 159 mm., collected by Dr. Mann at Bendaja.

PELMATOCHROMIS BÜTTIKOFERI (Steindachner)

Paratilapia (Pelmatochromis) büttikoferi STEINDACHNER, Notes Leyden Mus., vol. 16, p. 40, 1894 (Duqueah R. at Hill Town; Junk R.; Fischermann Sec).—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 390, fig. 263, 1915 (Nanna Kru, Liberia).—PELLEGRIN, Poiss. eaux douces Afr. Occid. p. 271, 1923 (Liberia).

The following specimens have been examined:

U.S.N.M. No. 118819, 14 specimens, 39 to 114 mm., Harbel, Wm. M. Mann.

U.S.N.M. No. 118820, 6 specimens, 17 to 105 mm., Bromley, Wm. M. Mann.

U.S.N.M. No. 118821, 10 specimens, 74 to 118 mm., Bendaja, Wm. M. Mann.

M.C.Z., 4 specimens, 39 to 62 mm., Du River, G. M. Allen.

PELMATOCHROMIS HUMILIS Boulenger

Pelmatochromis humilis BOULENGER, Cat. fresh-water fishes Africa, vol. 4, p. 333, fig. 194, 1916 (type locality, N. Sherbo district, Sierra Leone).—NICHOLS and LaMONTE, American Mus. Nov., No. 626, p. 2, 1933 (Kaleata, Liberia).

The National Museum collections contain the following specimens, all collected by Dr. Mann:

U.S.N.M. No. 118822, 17 specimens, 46 to 84 mm., Bendaja.

U.S.N.M. No. 118823, 29 specimens, 35 to 78 mm., Bromley.

U.S.N.M. No. 118824, 33 specimens, 34 to 93 mm., Harbel.

U.S.N.M. No. 118825, 16 specimens, 32 to 86 mm., Gibi Mountain.

PELMATOCHROMIS CAUDIFASCIATUS Boulenger

Pelmatochromis caudifasciatus BOULENGER, Ann. Mag. Nat. Hist., ser. 8, vol. 12, p. 69, 1913.

The Museum of Comparative Zoology contains 4 specimens, 34-55 mm., collected at Gbanga, Sept. 26, 1926, by G. M. Allen.

Genus TILAPIA Smith

Tilapia SMITH, Zool. South Africa, pl. 5, 1849 (type, *T. sparrmanni* SMITH).

TILAPIA PLEUROMELAS Duméril

Tilapia pleuromelas DUMÉRIL, Arch. Mus., vol. 10, p. 253, 1859. (*Sparus galilaeus* Artedi in Hasselquist is not valid as it is previous to 1758.)

Tilapia galilaea FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 243, 1919 (St. Pauls River).

The United States National Museum collections contain the following specimens:

U.S.N.M. No. 48505, 3 specimens, 55 to 66 mm., St. Pauls River, Mt. Coffee, Rolla P. Currie.

U.S.N.M. No. 118818, 3 specimens, 100 to 147 mm., Harbel, Wm. M. Mann.

TILAPIA BÜTTIKOFERI (Hubrecht)

Chromis büttikoferi HUBRECHT, Notes Leyden Mus., vol. 3, p. 66, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 39, 1894 (St. Pauls River).

Tilapia büttikoferi BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 214, fig. 138, 1915 (Liberia).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 245, 1919 (Liberia).—PELEGRIN, Poiss. eaux douces Africa Occid., p. 292, 1923 (Liberia).

The following specimens are in the National Museum collections:

U.S.N.M. No. 48491, 1 specimen, Monrovia, Mt. Coffee, O. F. Cook and G. N. Collins.

U.S.N.M. No. 48501, 1 specimen 195 mm., Mount Coffee, St. Pauls River, Rolla P. Currie.

U.S.N.M. No. 48502, 1 specimen, 89 mm., Mt. Coffee, St. Pauls River, Rolla P. Currie.

TILAPIA ZILLII (Gervais)

Acerina zillii GERVAIS, Ann. Sc. Nat., vol. 10, p. 203, 1848.

Dr. Mann collected 5 specimens, 24-76 mm., U.S.N.M. No. 118814, at Bellyella.

TILAPIA MELANOPLEURA Duméril

Tilapia melanopleura DUMÉRIL, Arch. Mus., vol. 10, p. 252, pl. 22, fig. 1, 1859.—BOULENGER, Cat. fresh-water fishes Africa, vol. 3, p. 192, 1915 (Nanna Kru Liberia).

Chromis niloticus STEINDACHNER, Notes Leyden Mus., vol. 16, p. 38, 1894 (Junk River).

The United States National Museum collections contain the following specimens:

U.S.N.M. No. 48510, 1 specimen, 173 mm., St. Pauls River, Rolla P. Currie.

U.S.N.M. No. 118815, 27 specimens, 21 to 60 mm., Bromley, Wm. M. Mann.

U.S.N.M. No. 118816, 4 specimens, 15 to 44 mm., Bendaja, Wm. M. Mann.

U.S.N.M. No. 118817, 5 specimens, 25 to 86 mm., Harbel, Wm. H. Mann.

TILAPIA SAVAGEI Fowler

Tilapia savagei FOWLER, Proc. U. S. Nat. Mus. vol. 56, p. 243, fig. 10, 1919 (St. Pauls River) (type, U.S.N.M. No. 48504; 4 paratypes, U.S.N.M. No. 48503).—PELLEGRIN, Poiss. eaux douces Afr. Occid., p. 289, 1923 (St. Pauls River, Liberia).

Chromis mossambicus HUBRECHT, Notes Leyden Mus., vol. 3, p. 66, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 39, 1894 (St. Pauls River).

The dorsal spines are XVI on all 5 types and not XV as indicated by Fowler.

The following specimens, collected by Rolla P. Currie, from St. Pauls River, are in the National Museum collections:

U.S.N.M. No. 48504 (holotype), 95 mm. standard length, 128 mm. total length.

U.S.N.M. No. 48504 (paratypes), 4 specimens, 68 to 90 mm. standard length, 90 to 116 mm. total length.

Family OPHICEPHALIDAE

Genus OPHICEPHALUS Bloch

Ophicephalus BLOCH, Naturg. Auslând. Fische, vol. 8, p. 137, 1794.

OPHICEPHALUS OBSCURUS Günther

Ophicephalus obscurus GÜNTHER, Cat. fishes British Mus., vol. 3, p. 476, 1861.—BÜTTIKOFER, Reisebilder aus Liberia, vol. 2, p. 448, 1890 (Liberia).—STEINDACHNER, Notes Leyden Mus. vol. 16, p. 36, 1894 (Fischermann See; Sulymak River and Buluma).

Family ANABATIDAE

Genus ANABAS Cuvier

Anabas CUVIER, Règne animal, ed. 1, vol. 2, p. 339, 1817. (Type: *Perca scandens* Daldorf.)

ANABAS KINGSLEYAE (Günther)

Otcnopora kingsleyae GÜNTHER, Ann. Mag. Nat. Hist., ser. 6, vol. 17, p. 270, pl. 13, fig. a, 1896.—HUBRECHT, Notes Leyden Mus., vol. 3, p. 68, 1881 (St. Pauls River).—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 37, 1894 (St. Pauls and Sulymak Rivers; "Waldbach bei Buluma and Fishermann See").

Anabas kingsleyae BOULENGER, Cat. fresh-water fishes Africa, vol. 4, p. 63, 1916 (Nanna Kru, Liberia).—FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 241, 1919 (St. Pauls River).

The following specimens have been examined:

- U.S.N.M. No. 48511, 1 specimen, 65 mm., St. Pauls River, R. P. Currie.
 U.S.N.M. No. 118836, 7 specimens, 43 to 78 mm., Bellyella, Wm. M. Mann.
 U.S.N.M. No. 118837, 10 specimens, 44 to 95 mm., Bendaja, Wm. M. Mann.
 U.S.N.M. No. 118838, 16 specimens, 47 to 135 mm., Harbel, Wm. M. Mann.
 U.S.N.M. No. 118839, 5 specimens, 70 to 143 mm., Bromley, Wm. M. Mann.
 U.S.N.M. No. 118840, 2 specimens, 58 and 80 mm., Gibi Mountain, 900 feet elevation, Wm. M. Mann.
 M.C.Z., 1 specimen, 74 mm., Gbanga, Sept. 26, 1926, G. M. Allen.

Length of head 3 to $3\frac{1}{4}$ and greatest depth $2\frac{1}{3}$ to $2\frac{2}{3}$ in standard length; scales in 25 rows, $2\frac{1}{2}$ above upper lateral line to dorsal and $5\frac{1}{2}$ between lower lateral line and anal fin; anal rays IX, 9 to 11, usually 10; dorsal rays XVI or XVII, 9 to 10, usually 10.

Order GOBIOIDEA

KEY TO THE FAMILIES OF GOBIOIDEA FROM LIBERIA

- 1a. Last or inner rays of pelvic fins connected by a membrane for more than half the way out toward their tips; usually a basal membrane is present. Gobiidae
 1b. Last or inner rays of pelvic separated to their base and not connected by a membrane at their base; no basal membrane. Eleotridae

Family GOBIIDAE

KEY TO THE GENERA AND SPECIES OF GOBIIDS FROM LIBERIA

- 1a. Dorsal rays XI to XIII-I, 11 or 12; anal I, 9 or 10; pectoral about 13; eyes prominent on top of head, much above the profile; scales small. Periophthalmus papilio Bloch
 1b. Dorsal rays VI-I, 9 to 11.
 2a. Scales 39 to 45; first few upper rays of pectoral fin filamentous; anal I, 8. Bathygobius soporator (Cuvier and Valenciennes)
 2b. Scales 60 to 70; first few upper rays not filamentous; anal I, 10. Gobius guineensis Peters

Genus PERIOPHTHALMUS Bloch

Periophthalmus BLOCH, in Schneider, Syst. Ichthy. p. 63, tab. 14, 1801. (Type: *P. papilio* Bloch, in Schneider.)

PERIOPHTHALMUS PAPILIO Bloch

- Periophthalmus papilio* BLOCH, in Schneider, Syst. Ichthy. p. 63, 1801.
Gobius koeleuteri PALLAS, Spicilegia, fasc. 8, p. 8, pl. 2, figs. 1-3, 1770.
Periophthalmus koeleuteri BÜTTIKOFER, Reisebilder aus Liberia, vol. 2, p. 449, 1890 (Liberia).
Periophthalmus koeleuteri Pallas var. *papilio* Bloch, STEINDACHNER, Notes Leyden Mus. vol. 16, p. 27, 1894 (Robertsport and Grand Cape Mountain, Liberia).
Periophthalmus barbarus (Linnaeus) FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 248, 1919 (Monrovia).

U.S.N.M. No. 4319 contains 1 specimen collected by J. C. Breevort in Liberia, no specific locality.

Genus **BATHYGOBIUS** Bleeker

Bathygobius BLEEKER, Arch. Neerl. Sci., vol. 13, p. 54, 1878. (Type: *Gobius petrophilus* Bleeker.)

BATHYGOBIUS SOPORATOR (Cuvier and Valenciennes)

Gobius soporator CUVIER and VALENCIENNES, Hist. Nat. Poiss., vol. 22, p. 56, 1837.
Mapo soporator (Valenciennes), FOWLER, Proc. U. S. Nat. Mus., vol. 56, p. 248, 1919 (Mount Coffee, Monrovia).

O. F. Cook and G. N. Collins collected 1 specimen, U.S.N.M. No. 48491, at Mt. Coffee, Monrovia.

Genus **GOBIUS** Linnaeus

Gobius LINNAEUS, Systema naturae, ed. 10, p. 202, 1758. (Type: *Gobius niger* Linnaeus.)

GOBIUS GUINEENSIS Peters

Gobius aeneofuscus var. *guineensis* PETERS, Monatsb. Akad. Wiss. Berlin, 1876, p. 248.

Gobius (*Chonophorus*) *tajastica* LICHENSTEIN, in Steindachner, Notes Leyden Mus., vol. 16, p. 25, 1894 (DuQueah River, at Hill Town; Fischermann See, Liberia).

The following collections have been examined:

U.S.N.M. No. 118794, 2 specimens, 57 to 82 mm., Bendaja, Wm. M. Mann.
 U.S.N.M. No. 118795, 2 specimens, 110 to 117 mm., Bellyella, Wm. M. Mann.
 U.S.N.M. No. 118796, 10 specimens, 39 to 145 mm., Harbel, Wm. M. Mann.
 M.C.Z., 1 specimen, 142 mm., Pea'htah, St. Pauls River, D. H. and G. M. Linden.

Family **ELEOTRIDAE**

KEY TO THE ELEOTRIDS FROM LIBERIA

1a. Scales about 50; anal usually I, 8. Dorsal VI–I, 8; no black bar across base of caudal fin; the latter barred however; streaks radiate from under eye.

Eleotris vittata Duméril

1b. Scales 32 to 34; anal I, 6 or I, 7; dorsal VI–I, 8. A black bar across base of caudal fin-----*Eleotris kribensis* Boulenger

Genus **ELEOTRIS** Bloch

Eleotris BLOCH, in Schneider, Systema Ichthy., p. 65, 1801. (Type: *Gobius pisonis* Gmelin.)

ELEOTRIS VITTATA Duméril

Eleotris vittata DUMÉRIL, Arch. Mus., vol. 10, p. 249, pl. 21, fig. 4, 1860.—STEINDACHNER, Notes Leyden Mus., vol. 16, p. 27, 1894 (DuQueah River, Liberia).—BOULENGER, Cat. fresh-water fishes Africa, vol. 4, p. 18, fig. 12, 1916 (Grand Cape Mt., River, Liberia, and Nanna Kru, Liberia).

"*Eleotris* (*Culius*) *pisonis* sp. L. Gmel. (*Eleotris gyrrinus* C. V., Gthr.)" STEINDACHNER, Notes Leyden Mus., vol. 16, p. 27, 1894 (DuQueah River at Hill Town, Liberia.)

The following specimens are in the United States National Museum collections:

U.S.N.M. No. 44828, 1 specimen, 139 mm., Liberia, without specific locality, O. F. Cook.

U.S.N.M. No. 118791, 30 specimens, 23 to 83 mm., Bendaja, Wm. M. Mann.

U.S.N.M. No. 118792, 83 specimens, 17 to 83 mm., Bromley, Wm. M. Mann.

U.S.N.M. No. 118793, 95 specimens, 39 to 96 mm., Harbel, Wm. M. Mann.

ELEOTRIS KRIBENSIS Boulenger

Eleotris kribensis BOULENGER, Ann. Mag. Nat. Hist., ser. 7, vol. 22, p. 52, 1907.

Dr. Mann collected the following specimens:

U.S.N.M. No. 118789, 3 specimens, 21 to 32 mm., Gibi Mountain.

U.S.N.M. No. 118790, 1 specimen, 19 mm., Harbel.



1



2



3

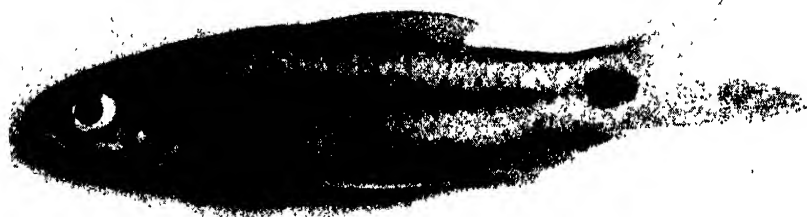
1, *Nannocharax seymboldi*, new species, holotype (U. S. N. M. No. 118757).

2, *Barilius silex*, new species, holotype (U. S. N. M. No. 118736).

3, *Mannichthys lucileae*, new genus and species, holotype (U. S. N. M. No. 118746).



1



2



3



4

- 1, *Barbus flomoi*, new species, holotype (U. S. N. M. No. 118737).
- 2, *Barbus boboi*, new species, holotype (U. S. N. M. No. 118740).
- 3, *Paramphilius freestonei*, new species, holotype (U. S. N. M. No. 118811).
- 4, *Micropanchax macrurus manni*, new subspecies, holotype (U. S. N. M. No. 118851).



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MEXICAN HERPETOLOGICAL MISCELLANY

By HOBART M. SMITH

STUDIES on the reptiles from Mexico in the United States National Museum have brought to light a number of unnamed races and species. Some of them have been diagnosed elsewhere, and the present compilation includes the remaining notes that appear worthy of preliminary publication in advance of the contemplated complete summary. A large portion of the material on which the present notes are based was collected and studied during my tenure of the Walter Rathbone Bacon Traveling Scholarship of the Smithsonian Institution, to whose authorities I am greatly indebted.

The following notes have been segregated under nine subtitles:

- 1.—Six new species and subspecies of *Sceloporus*, with a redefinition of the *formosus* group.
- 2.—A new horned lizard from Durango.
- 3.—A tentative arrangement and key to Mexican *Gerrhonotus*, with the description of a new race.
- 4.—An unnamed *Celestus* from Mexico, with a key to mainland species of the genus.
- 5.—New xantusid lizards.
- 6.—The Mexican subspecies of *Drymobius margaritiferus*.
- 7.—Notes on Mexican *Imantodes*.
- 8.—Two new snakes of the genus *Olelia*.
- 9.—Additional notes on *Conopsis*.

1.—SIX NEW SPECIES AND SUBSPECIES OF SCELOPORUS, WITH A REDEFINITION OF THE FORMOSUS GROUP

Material recently obtained in Mexico, particularly by my wife and me in 1939 and 1940, during my tenure of the Walter Rathbone Bacon Traveling Scholarship of the Smithsonian Institution, has

necessitated a redefinition of the entire *formosus* group, as well as of the subspecies of *jarrovi* in the *poinsettii* group. One other subspecies, anticipated when the review of the Mexican species was written,¹ has been defined on the basis of material collected by Dr. E. H. Taylor at Omilteme, Guerrero. Still another race, also anticipated previously, has been defined in *melanorhinus* of the *spinosus* group.

I am much indebted to Dr. Taylor for assistance in collecting numerous specimens, for the gift of several obtained by him in regions not visited by me, and for the loan of his own material. I am also greatly indebted to Dr. L. C. Stuart for permitting me to examine material recently collected by him in Guatemala, without which a satisfactory allocation of northern Central American members of the *formosus* group would have been impossible.

SCELOPORUS STEJNEGERI, new species

Holotype.—U.S.N.M. No. 112634, an adult male from Tierra Colorado, Guerrero.

Paratypes.—Twenty, including U.S.N.M. Nos. 112635–112648, and EHT-HMS Nos. 22285–22287, 27299–27301, all topotypes, collected by E. H. Taylor, Richard Taylor, and H. M. Smith.

Diagnosis.—A member of the *formosus* group, with a complete or very nearly complete, black nuchal collar, not light bordered; supraoculars large, seldom with an outer row of small scales, all separated from median head scales; frontonasals normal, in contact with each other; 2 canthals; dorsals 37 to 42; scales around body 45 to 50; femoral pores 16 to 21; generally 4 scales (minimum count) from median frontonasal to rostral.

Description of holotype.—Head somewhat elongate, not shortened and thickened as in *spinosus* group; interparietal relatively large, larger than entire frontal; parietal short, subtriangular, not reaching posterior edge of interparietal; a small, rectangular frontoparietal on each side; posterior section of frontal in contact with interparietal, less than a third size of anterior section of frontal; frontal ridges prominent; five large supraoculars, separated from median head scales by one row of small scales, from superciliaries by one complete row of small scales and by one or two tiny, extra scales; small, azygous scale separating prefrontals medially; frontonasals large, in contact with each other, median the largest; a large (mutilated), transversely elongate scale in front of median frontonasal; three scales from latter to rostral; two canthals; a subnasal, loreal, and single preocular; subocular elongate, followed by two keeled postoculars; six superciliaries, five visible from above.

¹ Field Mus. Nat. Hist., zool. ser., vol. 26, 1939.

Snout somewhat mutilated; labiomentals not reaching mental; gular scales notched posteriorly; temporal scales keeled, mucronate; no distinct auricular lobules.

Dorsal scales keeled, strongly mucronate, with several lateral mucrones, 39 from occiput to base of tail; 47 scales around middle of body; femoral pores 18–19; 20–21 lamellae under fourth toe.

Snout to vent 94 mm.; tail 128 mm.; snout to posterior border of ear 21 mm.; fourth toe 21 mm.

Color.—Bluish green above (yellowish where scales are not shed), unmarked save by a broad, black, nuchal collar, complete dorsally, and narrowly continuous around throat; digits and tail not notably barred. Throat greenish yellow anteriorly, becoming dark blue posteriorly; chest white; sides of belly dark blue, these areas reaching to groin and nearly to axilla but not onto thighs, and separated medially by a narrow light area only two or three scales wide; blue patches not dark bordered medially; ventral surfaces of limbs bluish.

Variation.—The 20 paratypes have the frontoparietals separated by contact of frontal and interparietal, except in one in which they are separated by a small azygous scale. The prefrontals are in contact in 3, separated by contact of frontal and median frontonasal in 3, and separated by an azygous scale in 14. The canthals are 2 in all, the anterior never above the canthal ridge. The frontonasals are normal except in 1, in which the median is separated from one of the laterals; the supraoculars are generally 5, sometimes 4 or 6, usually in 1 row, sometimes with a few small scales representing an outer row. The lorilabials are reduced to 1 row below subocular on 1 side in 4, on both sides in 8; the remainder have 2 complete rows below the subocular. The scales from the median frontonasal to rostral are 4 or 5 (4, 11; 5, 9). Other variations in scale counts are given in Table 1.

The young have faint, diagonal light and dark marks on the sides of the body. Both young and females have narrow, interrupted, transverse dark bands, about seven on the body and one or two on the neck. The nuchal collar is regularly present and complete in all, although sometimes not very well defined (in discolored specimens).

Comparisons.—This species has a higher femoral pore count than any other of the group. The only ones with which it may be compared are *m. acanthinus*, *formosus*, and *asper*. The first rarely has 16 femoral pores (its maximum count, occurring 3 times in 84 counts), the supraoculars are generally in contact with the median head scales, and the maximum dorsal scale count is 39. In *formosus* the dorsal scales reach their maximum count at 37 (4 in 52), the internasals are larger, there is no single large scale preceding the median frontonasal, and the coloration is considerably different. In *asper* the dorsals are 35 or less, and the coloration is much different.

Habits.—The species was found only on the boulders in the amazingly rugged canyon at the city limits of the small town of Tierra Colorada. They are not common, and are exceedingly wary; in fact, only one adult male has been obtained.

Remarks.—The name *stejnegeri* appeared as a nomen nudum in 1939². It was a lapsus for some other name, the identity of which is not apparent. It is a pleasure to fix the name for a species so distinct from others.

TABLE 1.—*Variation in scale counts of stejnegeri*

Catalog number	Sex	Dorsals	Scales around body	Femoral pores
U.S.N.M. 112635	♂	41	48	17-17
U.S.N.M. 112636	♂	39	48	17-19
U.S.N.M. 112637	♂	41	46	16-18
U.S.N.M. 112638	♂	41	49	17-17
U.S.N.M. 112639	♂	39	-----	18-?
U.S.N.M. 112640	♂	39	-----	16-17
U.S.N.M. 112641	♂	42	50	18-?
U.S.N.M. 112642	♂	41	49	17-17
U.S.N.M. 112643	♂	40	45	17-17
U.S.N.M. 112644	♂	37	48	19-19
U.S.N.M. 112645	♂	37	45	18-19
U.S.N.M. 112646	♂	40	46	16-19
U.S.N.M. 112647	♂	41	46	16-17
U.S.N.M. 112648	♂	-----	-----	-----
EHT-HMS 22285	♂	38	48	19-21
EHT-HMS 22286	♂	37	47	17-17
EHT-HMS 22287	♂	41	50	20-20
EHT-HMS 27299	♂	38	48	19-20
EHT-HMS 27300	♂	39	46	18-18
EHT-HMS 27301	♂	-----	50	18-20

SCELOPORUS FORMOSUS SCITULUS, new subspecies

Holotype.—EHT-HMS No. 26932, an adult male from Omilteme, Guerrero, collected August 2 to 4, 1940, by Richard C. Taylor and E. H. Taylor.

Paratypes.—EHT-HMS Nos. 26956-26961, 26963-26975, and U.S.N.M. Nos. 111827-111828, same data as holotype; U.S.N.M. No. 47738, a topotype³; Mus. Comp. Zool. Nos. 34228, 34230, from Chilpancingo, Guerrero.

Diagnosis.—Similar to Veracruz and Oaxaca *f. formosus*, except: Males with large, scattered, light blue spots on head; dorsal surface brilliant green, save a dark line down the adjacent edges of the

² Ibid., p. 70.

³ This is a very young specimen, once referred by me to *mucronatus omiltemanus* (Univ. Kans. Sci. Bull., vol. 24, p. 594, 1936), before I was aware that other large species of *Sceeloporus* occur in the region.

dorsal scale rows; posterior portion of throat (males) black, scales in median area black-edged with blue centers, scales anteriorly pale blue; no yellow or orange on throat; females and young of both sexes with parallel, longitudinal, alternating light and dark lines on neck.

Description of holotype.—Dorsal scales 30; scales around body 39; femoral pores 14–14; 2 canthals.

Color.—Dorsal surface of body brilliant green; continuous, parallel, longitudinal black lines following the edges of the dorsal scale rows; dorsal surface of head black, with a light spot on each parietal, on the interparietal, posterior section of frontal, both prefrontals, lateral frontonasals, posterior pair of internasals, and on several of the supraoculars and superciliaries; a large, black shoulder patch on each side, the two separated from each other by six scale rows; the black of shoulder patches continuous around neck; scales on posterior part of throat edged with black or very dark blue, the centers light blue; scales on anterior part of throat and chin pale blue with darker edges. Chest, a broad line down middle of abdomen, ventral surfaces of limbs and tail and preanal region all slightly bluish; sides of abdomen dark blue, and these areas with a narrow, poorly defined, black median border.

Variation.—Females lack the brilliant green and blue color of the males, but may have light spots on the head.

In the young the back is more or less uniform gray or slate; on the neck is a median longitudinal light line extending from the upper edge or slightly above the ear to the upper edge of the black shoulder patches; these are bordered medially by a narrow dark line of similar extent; these in turn bordered by a light line, which is separated from its mate by a median dark line; another light line extends from the posterior portion of the supralabial region through the ear and terminates abruptly on the middle of the neck; below this is another light line from ear to the black shoulder patches.

Females are marked much like the young, except that the neck markings are not quite so distinct; most distinct is the dorsolateral light line and its bordering dark line, from upper edge of ear to upper edge of the shoulder patch. Some adult females have light marks on the head, similar to males.

Comparisons.—There are no well-marked differences between *f. formosus* and *f. scitulus* in scutellation. The latter form has a lower average dorsal count than the former, but the range of variation of the one form overlaps that of the other too extensively to permit separation of any population on the basis of this character. Twenty-six of *f. scitulus* show a range from 30 to 34 (30, 4; 31, 7; 32, 4; 34, 4),

average 31.9; while 49 *f. formosus* show a range of from 32 to 37 (32, 8; 33, 11; 34, 9; 35, 11; 36, 6; 37, 4), average 34.2.

The only difference of recognizable significance between the two races is in pattern; in this there is a very striking divergence between them. Males, females, and young of *f. formosus* lack the longitudinal light and dark lines on the neck, and the scattered light spots on the head, of *f. scitulus*; and the adult males of the former are blue, not green as in the Guerrero race, lack the longitudinal dark lines on the dorsal surface of the body and have a broad yellow or orange area on the middle of the throat. In males of *f. scitulus* yellow or orange on the throat is completely absent, the whole throat being blue.

Remarks.—The race *f. scitulus* is illustrated in *The Mexican and Central American Lizards of the Genus Sceloporus*.⁴

SCELOPORUS PREZYGUS, new species

Holotype.—U.S.N.M. No. 46881, from Conjab, 5,300 feet, Chiapas (between San Bartolomé and Comitán). Collected by E. W. Nelson and E. A. Goldman.

Diagnosis.—A member of the *formosus* group, with 31 dorsal scales, supraoculars in 2 rows, 13 to 14 femoral pores, 2 canthals and median frontonasals separated from lateral frontonasals.

Description of holotype.—Head somewhat flattened and elongate; interparietal about three times as large as a parietal; a single parietal on each side, but little larger than a frontoparietal; latter single on each side; frontal narrowly in contact with interparietal; supraoculars in two rows; the scales of the inner row about twice as large as those of outer row, which is composed of three scales; supraoculars separated from median head scales by a complete row of granular scales, from superciliaries by one complete and another incomplete row of small scales; frontal in contact with median frontonasal; latter considerably larger than lateral frontonasals, separated from them by a small scale; scales in internasal area large, keeled, pitted, three from median frontonasal to rostral; two canthals; a large, elongate subnasal; three small loreals; preocular longitudinally divided, a large upper and small lower scale; an elongate subocular and two keeled postoculars; two complete rows of lorilabials below subocular; four supralabials and five infralabials to a point below middle of eye.

Two rows of labiomentals, the outer not reaching mental, the inner extending anteriorly to a point even with the suture between the second and third infralabials; posterior gulars notched; temporal scales keeled, very feebly mucronate; three small auricular lobules, upper largest; scales between ear and lateral nuchal pocket more strongly

⁴Field Mus. Nat. Hist., zool. ser., vol. 26, pl. 1, 1930.

keeled and mucronate, with a number of fine, lateral mucrones; scales between lateral nuchal pocket and foreleg keeled, rather strongly mucronate, the largest larger than scales posterior to ear or in temporal region.

Dorsal scales keeled, mucronate and denticulate to a moderate degree, 31 from occiput to base of tail; 36 scales around middle of body; 13 to 14 femoral pores; 22 lamellae under fourth toe; snout to vent 77 mm.; tail 112 mm.; snout to posterior margin of ear 19.9 mm.; snout to occiput 15.9 mm.; fourth toe 21.7 mm.; hind leg 55.5 mm.

Color.—Dorsal surface yellowish gray (slightly bluish where scales are shed); a narrow, black nuchal collar, complete on dorsal surface, scarcely visible on throat; collar not extending onto arm, not over two scales in width. Dorsal surface otherwise unmarked. Gular region and chin uniform blue, except a gray area about throat in front of chest; latter white; sides of abdomen apparently lavender, with a broad border covering a width of three scales; latter extending from groin nearly to a line even with axilla, but not extending laterally anteriorly to enter axilla. Ventral surfaces of limbs and tail white.

Remarks.—This specimen was referred by me in 1936⁵ to *serrifer*, although several of its peculiarities were pointed out; and in 1939⁶ it was referred to *mucronatus omiltemanus*. Recent material from Chiapas and Guatemala has shown that the characters previously considered as anomalous have considerable significance. This specimen does not belong to *serrifer*, although the belly pattern is the same, since it has the supraoculars in two rows and the frontonasals separated from each other. The latter species is the nearest one of the *poinsettii* group; the more remote *omiltemanus* and its relatives, although having similar supraoculars, have the frontonasals in contact and a different belly pattern. In fact, it is believed that *prezygus* belongs to the *formosus* rather than to the *poinsettii* group, since it has a very narrow collar not light bordered (apparently). It differs widely from others of the *formosus* group, however, in having large dorsals, the frontoparietals separated from each other, supraoculars in two rows, etc. It appears to be a link between the *formosus* and *poinsettii* groups, in the same manner as *lunaei* and *acanthinus* are obviously links between the *formosus* and *spinosus* groups. All members of the latter group can be traced to *acanthinus* and *lunaei*, while all of the *poinsettii* group can be traced to *prezygus* and *serrifer*. The name *prezygus* refers to the phylogenetic position of this species, near the ancestral type of the collared (*poinsettii*) group of the genus.

⁵ Kansas Univ. Sci. Bull., vol. 25, pp. 561, 562, 1936.

⁶ Field Mus. Nat. Hist., zool. ser., vol. 26, p. 221, 1939.

KEY TO MEMBERS OF THE FORMOSUS GROUP

1. Typically one canthal----- 2
Typically two canthals----- 4
2. Supraoculars very large, in a single row, frequently one or more in contact with median head scales; dorsals 31 to 38; a lowland species; Motagua River valley and arid basin at Salamá, Guatemala----- *lunaei*
Supraoculars smaller, in 2 rows, rarely any in contact with median head scales; dorsals 30 to 51; highland races----- 3
3. Dorsals 30 to 39; El Salvador and central Honduras to Panama
malachiticus malachiticus
Dorsals 39 to 51; central plateau of Guatemala and its extensions
m. smaragdinus
4. Median separated from lateral frontonasals----- 5
Median in contact with lateral frontonasals----- 7
5. Dorsals about 31; internasals large, keeled, 3 from rostral to median frontonasal; known only from Conjab, between San Bartolomé and Comitán, Chiapas----- *prezygus*
Dorsals 37 to 45; internasals smaller, not keeled, rugose or not----- 6
6. A complete nuchal collar, sometimes narrowly interrupted medially; central Veracruz to Isthmus of Tehuantepec----- *malachiticus salvini*
Nuchal collar incomplete; highlands of Chiapas and northern Guatemala in Cobán area----- *m. taeniocnemis*
7. Anterior section of frontal usually longitudinally divided; canthals sharply ridged; no nuchal collar; ventrals a fourth, laterals not more than two-thirds, size of dorsals; mountainous regions of western Mexico from Nayarit to Guerrero----- *asper*
Anterior section of frontal rarely longitudinally divided; canthals rounded; a nuchal collar or not; ventrals a half, laterals three-fourths size of dorsals----- 8
8. A broad, nearly or quite complete, nuchal collar----- 9
Collar, if present, restricted to sides of neck----- 10
9. Femoral pores 12 to 16; one or more of supraoculars generally in contact with median head scales; Pacific coast foothills, Chiapas to El Salvador
malachiticus acanthinus
Femoral pores 16 to 21; supraoculars not in contact with median head scales; central Guerrero (Tierra Colorada)----- *stejnegeri*
10. Males without yellow on throat, dorsal scale rows black-edged, dorsal head scales with a light blue center; central Guerrero----- *formosus scitulus*
Males with yellow or orange on throat, dorsal surface uniform blue, head scales not light-spotted; central Veracruz south in mountainous regions to the Isthmus of Tehuantepec----- *f. formosus*

SCELOPORUS MUCRONATUS AUREOLUS, new subspecies

Holotype.—U.S.N.M. No. 112232, male, 2 miles west of Acultzingo, Veracruz.

Paratypes.—Twenty-six topotypes (Nos. 112233–112258) in the United States National Museum; 36 topotypes (Nos. 3073–3080, 3082–3102, 3171–3174, 3193–3195) in the EHT–HMS collection; 16 specimens (No. 1516) from Atzitzintla, Puebla, in the Field Museum of Natural History; and 6 specimens (Nos. 18815–18820) from the vicin-

ity of Puebla, Puebla, in the American Museum of Natural History.

Diagnosis.—Similar to *m. mucronatus*, except: Dorsal scales usually more than 32; femoral pores usually over 13; no parallel longitudinal dark lines on middle of throat; adult males usually with longitudinal dark lines following the edges of the dorsal scale rows; centers of scales light; collar involving not over 4 scale lengths longitudinally.

Remarks.—I described this subspecies in detail⁷ as *mucronatus omiltemanus*. The latter name, however, must be restricted to the larger scaled, broad-collared form lacking longitudinal dark lines following the dorsal scale rows, that occurs in the isolated mountain range of central Guerrero.

Comparisons.—*S. m. aureolus* is amply well differentiated from both *mucronatus mucronatus* and *m. omiltemanus* by having more numerous dorsals (30 to 38, average 34.3, 91.6 percent over 31 in 59 *aureolus*; 27 to 32, average 29.6, 93.6 percent 31 or less in 49 *mucronatus*; 29 to 32, average 30, 92.3 percent less than 32 in *omiltemanus*), and a lined dorsal pattern in adult males. From *m. mucronatus* it also differs in average femoral pore count (11 to 17, average 14, in 124 counts of *aureolus*; 10 to 17, average 12.8, in 94 counts of *mucronatus*; 11 to 16, average 13.8, in 26 counts of *omiltemanus*) and in lacking the parallel, longitudinal dark lines on the throat (present in all except adult male *mucronatus*, lacking in *omiltemanus*). It is apparent that *m. mucronatus* and *m. omiltemanus* are more like each other than either is like *aureolus*. They differ from each other in dorsal pattern; *omiltemanus* lacks the large dorsal blotches and the parallel, longitudinal dark lines on the throat of *mucronatus*, and in addition has a collar involving at least 4½ scale lengths (4 or less in *mucronatus*).

SCELOPORUS JARROVII SUGILLATUS, new subspecies

Holotype.—U.S.N.M. No. 112100, male, from the edge of the east end of Lake No. 4, Zempoala, Mexico, Mexico.⁸

Paratypes.—Fifty-four, all topotypes, including U.S.N.M. Nos. 112072–112099, 112101–112111, and EHT–HMS Nos. 22311–22321.

Diagnosis.—Supraoculars in 2 rows; dorsal scales 37 to 44, average 40.6; median lateral body scales distinctly smaller than middorsal scales; scales on dorsal surface of upper foreleg about twice as large as those on lower foreleg; gray or blue-gray above, streaked, with a rather broad, black nuchal collar (6 to 8 scales wide); sides of belly slate blue, not black-edged, with vertical streaks of black; chin light blue; males and females practically indistinguishable in ventral color.

⁷ Kansas Univ. Sci. Bull., vol. 24, pp. 591–598, text fig. 12, pl. 50, fig. 1, 1936.

⁸ The boundary line between the states of Morelos and Mexico passes through the National Park of Zempoala. Most of the park is in the State of Mexico.

Description of holotype.—Interparietal a little less than three times size of parietal; one frontoparietal on each side, separated from each other by a small median scale; posterior section of frontal a little more than half size of anterior; two prefrontals in contact medially; three frontonasals, the median not separated from the others; internasals irregular; four postrostrals; two canthals; a subnasal and an elongate loreal; preocular divided transversely; an elongate subocular and two postoculars; two rows of lorilabials, complete below eye; two rows of supraoculars, the scales in the outer row about one-half to one-third size of scales in inner row; outer row of labimentals not reaching mental; inner row reaching to suture between second and third infralabials; four supralabials to a point below middle of eye; most of gular scales with a single apical notch; those near gular fold area with two notches.

Temporal scales keeled, rather strongly mucronate; six auricular lobules on one side, four on other; scales between ear and lateral nuchal pocket about half size of dorsal scales, larger than scales between lateral nuchal pocket and arm, keeled and strongly mucronate, weakly denticulate. Dorsals weakly keeled, mucronate, feebly denticulate (more strongly anteriorly); lateral scales a little more strongly mucronate and more denticulate than dorsal scales; scales distinctly decreasing in size laterally, those halfway between axilla and groin smaller than middorsal scales; 41 scales from occiput to base of tail; 46 scales around middle of body.

Scales on dorsal surface of upper foreleg-nearly twice as large as those on lower foreleg, all keeled, mucronate and denticulate; dorsal scales on shank and thigh subequal to each other and to scales on dorsal surface of upper foreleg, a little smaller than dorsal scales on body, and a little more strongly keeled and mucronate; dorsal scales on tail considerably larger than dorsals on body, more strongly keeled and mucronate; subcaudals smooth except toward tip of tail; femoral pores 15-16.

Snout to vent 85 mm.; tail 125 mm.; tibia 15 mm.; snout to occiput 16 mm.; snout to posterior border of ear 20 mm.

Color.—Adult male: Entire dorsal surface dark slate gray, without markings save a broad, black nuchal collar covering eight scales medially; collar bordered on either edge by a narrow, light, uninterrupted band one scale wide; digits feebly banded; tail with very indistinct dark bands distally. Ventral surface of head dark blue; black nuchal collar extending onto gular region, almost interrupted midventrally; area between arm insertions and a broad median line on belly mostly light; sides of belly, from axilla to groin, blue-gray, not black-bordered medially; numerous, distinct, transverse black streaks on sides of belly, not extending as far medially as the bluish

patches; groin nearly black; ventral surfaces of limbs and tail light.

Variation.—In 44 specimens the dorsals vary from 37 to 44, average 40.3; in 64 counts the femoral pores vary from 14 to 18, average 16. In all the dorsal scales on the lower foreleg are constantly about half the size of those on the upper foreleg.

Adult females are so remarkably like the males in ventral as well as dorsal coloration that they can be distinguished only with difficulty by this means. The largest measures 77 mm. snout to vent; the largest male measures 87 mm.

Comparisons.—This is one of the most distinct of the races of *jarrovii*, having peculiarities both in pattern and scutellation. The transverse black streaks on the sides of the belly do not occur in any other form of *jarrovii*; in fact the only other species having similar marks is *dugesii*, a species very different from *jarrovii* in the conformation of the scales (mucrones arising within the edges of the scales on sides of body and neck). In no other subspecies of *jarrovii* do the females have the same ventral coloration as the males; such a phenomenon is of rare occurrence in *Sceloporus*, and has been observed in no other species of the *poinsettii* or related groups.

The most obvious peculiarity in scutellation is the relatively small size of the dorsal scales on the lower foreleg, compared with those on the upper foreleg (nearly twice as large). This character will separate it from all other subspecies of *jarrovii*. It agrees with *immucronatus* in having the lateral scales distinctly decreasing in size, and distinctly smaller than the dorsals. In the other subspecies the lateral scales, at a point about halfway between axilla and groin, are subequal to or larger than the dorsals; they do not distinctly increase in size medial to this point.

Habits.—These specimens were found sunning themselves on the rocks scattered on the eastern edge of Lake No. 4, at the Lakes of Zempoala, in the State of Mexico (reached via Tres Cumbres, Morelos). The elevation is about 10,000 feet above sea level. The lizards are extremely wary, so that it was necessary to stalk them from behind boulders in order to get within gunshot of them. Although the rocks and cliffs around several other lakes on the park were examined, *sugillatus* was not found, although *f. ferrariperezi* was very abundant. The latter was excluded in the spots where the former was found.

KEY TO THE SUBSPECIES OF *SCELOPORUS JARROVII*

1. Lateral body scales distinctly decreasing in size laterally, at a point halfway between axilla and groin, distinctly smaller than dorsal scales..... 2
 Lateral body scales not decreasing in size laterally at least up to a point halfway between axilla and groin, where they are still subequal to, or even a little larger than, middorsal scales..... 3
2. Dorsal scales on lower foreleg about half size of those on upper foreleg; dark transverse streaks in lateral belly patches; nuchal collar covering six scales

medially, or more; high mountains near the southern edge of the plateau, known only from Zempoala, Morelos and Mexico----- *jarrovi* *sugillatus*
Dorsal scales on lower foreleg but little if any smaller than those on upper foreleg; no dark streaks in lateral belly patches; nuchal collar less than four scales long middorsally; eastern mountains of Mexico, from northern Querétaro south into Hidalgo and possibly central Veracruz

jarrovi *immucronatus*

3. Supraoculars essentially in one row; if an outer row is evident, it is composed of scales much smaller than those of inner row, and usually number no more than two; mountains of western Mexico, from Nayarit north into southern Arizona and New Mexico----- *jarrovi* *jarrovi*

Supraoculars in two rows, those of outer row a little smaller than those of inner, usually numbering three or more----- 4

4. Adult males black above and below, with orange areas and spots on sides of head, belly, and tail; only throat, underside of tail, and posterior surface of hind leg not black; females somewhat similar, very dark above, the collar poorly defined; young with poorly defined, narrow, light borders on neck collar; dorsal scales average 37.5; southeastern Coahuila--- *jarrovi* *oberon*

Adult males light brown above, with very broad, very well defined nuchal collar; a median area on belly white except in very largest males; sides of abdomen blue, black edged; females and young with more distinct light borders on nuchal collar; dorsal scales average 40.6; central plateau region from central Mexico (State) north to northern Zacatecas--- *jarrovi* *minor*

SCELOPORUS MELANORHINUS CALLIGASTER, new subspecies

Holotype.—U.S.N.M. No. 112201, Acapulco, Guerrero.

Paratypes.—U.S.N.M. Nos. 112199–112200, 47732, topotypes; No. 112186, Coyuca, Guerrero; Nos. 112202–112203, 4 kilometers north of Apatzingán, Michoacán; San Blas, Nayarit (Nos. 51384–51389, 64667); “Guadalajara,” Jalisco (Nos. 24925–24926); Colima (Nos. 31496, 58159); Tamarindo, Guerrero (No. 47731). Also EHT-HMS Nos. 8279–8299, Hda. El Sabino, Michoacán; Nos. 8302–8310; Acapulco; Nos. 8267–8270, Hda. Quesería, Colima; Nos. 8273A, 8271–8278, Hda. Paso del Río, Colima. Univ. Mich. Mus. Zool. No. 80070, Hda. Paso del Río, Colima; No. 80069, Hda. Gloria, Colima.

Diagnosis.—Similar to *S. melanorhinus melanorhinus*, except femoral pores usually (84 percent) less than 20 on each side; lateral belly patches usually confluent medially in adult males.

Description of holotype.—Adult male, 85 mm. snout to vent; dorsal scales 27; femoral pores 17–18; lateral belly patches partially confluent medially.

Comparisons.—This subspecies is distinguished from typical *melanorhinus* largely upon the basis of average femoral pore count. Ninety-three counts of 46 specimens from Guerrero north show a range of variation from 17 to 24, average 19.2, with 16.1 percent of the counts over 20. Fifty-eight counts of 29 specimens of typical *melanorhinus* from Oaxaca show a range of variation from 18 to 27, average 21.6, with 77.6 percent of the counts over 20.

An approximately similar comparison can be made of the total pore counts of specimens of the 2 subspecies. In *m. calligaster* the range is from 34 to 46, average 38.4, and 19.6 percent of the counts (46) are over 40. In *m. melanorhinus* the range is from 37 to 53, average 42.8, and 82.8 percent of the counts (29) are over 40.

All counts available for the species were used in calculating percentages. The contrasts between the 2 races would be somewhat greater if specimens from certain central Guerrero localities (Mexcala, Tierra Colorada) were omitted as intergrades. The series available are not sufficiently large to demonstrate whether these localities actually are occupied by intergrading populations, and for this reason the questionable specimens were not omitted. It is noteworthy, however, that the occurrence of counts over 20 is greater there than elsewhere in *m. calligaster*. Subspecies of other species apparently intergrade also in this area: e. g., *Uta b. bicarinata* and *b. anonymorpha*; *Sceloporus h. horridus* and *h. oligopus*.

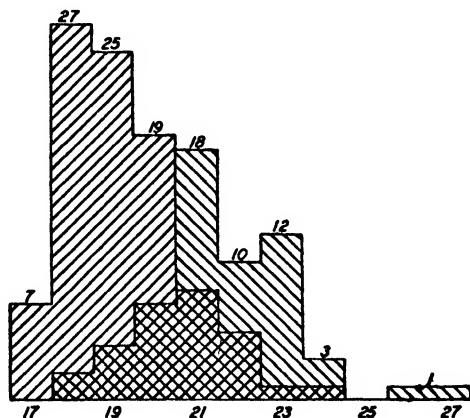


FIGURE 38.—Diagram showing range of variation in femoral pore counts of *melanorhinus*. The numbers on the vertical columns refer to the number of specimens, and those on the base line refer to the number of pores. The lines directed toward the upper right represent *m. calligaster*, while those directed toward the upper left represent *m. melanorhinus*. The cross-hatched area indicates the extent of overlap.

2.—A NEW HORNED LIZARD FROM DURANGO

A series of four specimens of *Phrynosoma douglassii* from the zoologically poorly known Mexican state of Durango differs from all others of the species by having a much-reduced tail. These individuals are very different from the longer-tailed *Phrynosoma orbiculare* recorded from Chihuahua^{*} and Durango (El Salto, U.S.N.M. No. 47469). They appear to belong to an unnamed race, for which I propose the name

^{*} Taylor and Knobloch, Proc. Biol. Soc. Washington, vol. 53, pp. 125, 126, 1940.

PHRYNOSOMA DOUGLASSII BRACHYCERCUM, new subspecies

Holotype.—U.S.N.M. No. 23993, from "Durango," Mexico, collected by Dr. Edward Palmer, September 1896.

Paratypes.—Three topotypes, Nos. 23994–23996, same collector and date.

Diagnosis.—Similar to *Phrynosoma douglassii*, but with a tail shorter than head is wide, or, in adults, very slightly longer; gular scales in straight rows slightly diverging posteriorly, the scales small and tubercular (strongly convex), not flat; chest scales keeled; horns of head very short, postorbitals, temporals, and occipitals subequal in size.

Description of holotype.—Head a broad, short, conventionalized heart-shape in dorsal profile; in lateral profile, postorbital spines highest, supraocular and internasal areas forming an obtuse angle with each other (not a curve); width of head (26.2 mm.) at widest point in temporal region much greater than length of head from snout to occiput (15.6 mm.) or to posterior tip of temporal spines (21 mm., in a projected straight line); supraocular region flat, with no enlarged scales; posterior border of supraocular region strongly indented medially, marked by a series of enlarged, slightly protuberant scales; each series begins at postorbital spine and extends anteromedially, but fails to reach its mate by 1 scale; postorbital, occipital, and temporal spines subequal in size; 5 scales between occipital spines; 2 small, flat spines, separated from each other by a scale, preceding occiput; 3 subequal temporal spines, the posterior slightly separate from others, the series continuing anteriorly as a row of enlarged scales, disappearing below about middle of eye.

Three posterior infralabials considerably enlarged; all labials keeled; a series of enlarged, keeled scales in contact with a few infralabials anteriorly but separated throughout the remainder of its length by one to three rows of small scales; gulars in very definite, straight rows slightly diverging posteriorly; these scales not flat, but small and convex (tubercular); in extreme posterolateral portion of throat the scales are strongly protuberant and conical, and have no free lateral edges.

An irregular series of preauricular spines; tympanum exposed; a large skin fold anterior to lateral nuchal pocket, and a small one posteriorly, the former surmounted by two series of spines, the latter by one or two spines; a small, vertical series of spines in front of and above arm insertion.

All dorsals keeled, imbricate (except enlarged spines), not granular; among these are scattered, enlarged, keeled spines of varying size, diminishing laterally; a single row of lateral spines (fringe); in the posterior part of fringe the spines are separated from each

other, while anteriorly they are in contact; spines on tail few, small; tail very broad at base, but remainder very slender, not tapering into base; eight longitudinal series of spines at base of tail.

Scales on chest rather distinctly keeled; remainder of ventral scales smooth; femoral pores 16–18; 14–16 lamellae under fourth toe. Total length 80 mm.; tail 24 mm.

Head slightly reddish; body dirty straw yellow, with transverse, median, dusky (gray) crossbands; limbs feebly barred; throat, chest, and sides of abdomen with small, round, scattered dark spots.

Variation.—The three paratypes are much as the type. All have convex gulars, although some of the scales show edges. The keels on the chest scales are very evident even in the smallest specimen.

Measurements (in millimeters) of d. brachycercum

Catalog number	Sex	Snout to vent	Head width	Tail	Percent, tail of body	Percent, head of tail
U.S.N.M. 23993-----	♀	80. 0	26. 2	24. 0	30. 0	109. 1
U.S.N.M. 23994-----	♀	71. 0	24. 0	23. 0	32. 4	104. 3
U.S.N.M. 23995-----	♀	38. 7	12. 8	10. 0	28. 7	128. 0
U.S.N.M. 23996-----	♀	71. 0	22. 8	23. 0	32. 4	99. 1

Comparisons.—These four specimens appear to represent a race closely related to *douglassii* and its subspecies. The ludicrously short, slender tail attached to a broad base readily characterizes it, and is the chief difference between it and other races of *douglassii*. The convex gular scales and keeled chest scales also appear to be peculiar to *d. brachycercum*.

In 74 specimens of other races of *douglassii* (including 15 whose measurements are given by Van Denburgh, Rept. Western North Amer., 1922), the tail varies from 36.1 to 65.2 percent of the body length, average 47.5; sexed specimens show a range of from 36.1 to 53.2 percent, average 45.4, in females, 44.1 to 65.2 percent, average 51.4, in males. The width of the head varies from 36 to 92.4 percent of the tail length, average 65.1; sexed specimens show a range from 53 to 86.9 percent, average 67.3, in females, 48.6 to 80.2 percent, average 62.0, in males.

3.—A TENTATIVE ARRANGEMENT AND KEY TO MEXICAN GERRHONOTUS, WITH THE DESCRIPTION OF A NEW RACE

A survey of the Mexican *Gerrhonotus* in the United States National Museum has revealed the existence of a much greater variability in certain characters in scutellation of the head than has heretofore been known. Of surprising variability is the azygous

prefrontal, the presence or absence of which has been used as a generic or group character. In the most primitive group (*deppii*) of the genus, it varies intraspecifically to a considerable degree; in specimens from a single locality of at least two species it is completely absent in some, well formed in others. In the next most primitive group (*antagues*) it varies greatly interspecifically; three species regularly lack it, while the remainder regularly have it. Only in the other three, more highly modified groups does the azygous prefrontal serve as a group character; in the *liocephalus* and *caeruleus* groups it is regularly present, and in the *imbricatus* group it is regularly absent.¹⁰

All five groups of the genus are represented in Mexico by at least one species. The *deppii* group is composed of six in Mexico: *deppii*, *fimbriatus*, *gramineus*, *oaxacae*, *taeniatus*, and *ochoterenai*. Only four other names have been proposed in this group; *diguetsi* from Puebla (a synonym of *taeniatus*, not of *deppii*, of which it was described as a subspecies), *auritus* from Verapaz, Guatemala (apparently distinct; the type has an azygous prefrontal, contrary to Boulenger's statement), *vasconcelosii* from Argueta, Pacific slope of Guatemala, and *rhombifer* from Panama. The latter is placed in this group with some hesitation, by description alone; I have seen no specimens. The group is the only one arboreal in habits. The flat head, poorly developed lateral fold, elongate dorsal scales, and large size of the granular scales on the limbs as well as on the sides of the head and neck, characterize this group. Several species are green.

The other 4 groups are composed of terrestrial species. The most primitive group (*antagues*) is composed of apparently 6 species, in Mexico: *antagues*, *bocourti*, *gadovii*, *modestus* (type locality apparently Orizaba, not Guatemala as guessed by Cope), *obscurus*, and *viridiflavus*. All but one of these (*gadovii*) is known from so few specimens that further material may show that some of these names are based on variants. All names proposed for Mexican specimens appear to be valid. Extralimital are *alfaroi* (Costa Rica), *monticola* (Costa Rica), *morelettii* (Guatemala) and *salvadorensis* (Salvador); the first 2 appear to be identical¹¹ and the last 2 also may prove conspecific with each other.¹² The group is characterized by having a moderately well developed lateral fold (not a deep one as in the 3 more recent groups); essentially a single loreal (sometimes a very small accessory loreal); supranasals present (sometimes enlarged to appear like a *second* pair of internasals); head scales flat; superciliary series complete; dorsal scales 45 or more.

¹⁰ One specimen in 83 of the whole group has a tiny azygous prefrontal.

¹¹ Wettstein, Sitzs. Akad. Wiss. Wien, math.-naturw. Kl., Abt. 1, vol. 148, pp. 28-29, figs. 1-9, 1934.

¹² Dunn and Emlen, Proc. Acad. Nat. Sci. Philadelphia, vol. 84, pp. 28-30, 1932.

The *liocephalus* group is composed of a single widely distributed species, which appears to have recognizable races. The names *infernalis*, *lemniscatus*, *liocephalus*, *ophiurus*, *tessellatus*, and *ventralis* have been proposed and are available in this group. I can distinguish three races: *l. liocephalus*, *l. ophiurus*, and *l. infernalis*. The elongate body and tail, and the presence of at least two large loreals, one following the other, characterize the group; the superciliary series is complete, and the azygous prefrontal is large and regularly present.

The *caeruleus* group, with 11 recognized species and subspecies¹⁸ is the largest of the genus. The 19 names proposed in the group are: *burnettii*, *caeruleus*, *cedrosensis*, *formosa*, *grandis*, *ignavus*, *kingii*, *marginata*, *multicarinata*, *multifasciata*, *nanus*, *nobilis*, *palmeri*, *paucicarinatus*, *principis*, *scincicauda*, *shastensis*, *webbii*, and *wiegmanni*. Only *kingii* occurs in mainland Mexico. The group is characterized by the absence of the supranasal (fused with first pair of internasals, a unique character in *Gerrhonotus*), regular contact of rostral and nasal, and regular presence of an azygous prefrontal.

The most highly modified group (*imbricatus*) is confined to Mexico, so far as known at present. It is the only one that has completely lost the azygous prefrontal. Other characters are: Convex head scales (except *planifrons*); reduction of superciliary series, which rarely reaches beyond the median outer supraocular, leaving the posterior outer and posterior inner in contact with orbit. Seven names have been proposed in this group, and one more is added below; of these eight, six can be associated with apparently recognizable species and subspecies: *i. imbricatus*, *i. adspersus*, *l. levicollis*, *l. ciliaris*, *planifrons*, and *rudicollis*. Of these the most doubtful are *i. adspersus* and *planifrons*. *G. lichenigerus* and *olivaceus* are synonyms of *i. imbricatus*.

GERRHONOTUS LEVICOLLIS CILIARIS, new subspecies

Holotype.—U.S.N.M. No. 47496, from Sierra Guadalupe, Coahuila, collected by E. W. Nelson and E. A. Goldman, April 28, 1898.

Paratypes.—Thirteen. Two topotypes, Nos. 47497–8; Sierra Madre, Zacatecas (Nos. 46723–46724); Inde, Durango (No. 46843); mountains near San Luis Potosí, S.L.P. (Nos. 47207–47210); and San Felipe, Guanajuato (EHT–HMS Nos. 10418–10421).

Diagnosis.—Like *levicollis*, with 16 dorsal scale rows, no azygous prefrontal and convex head shields, except: Dorsal scales 40 to 50, average 42.7; 2 superimposed loreals or, if 1, obviously the lower fused with upper; loreal in contact with prefrontal; usually 3 superciliaries, and always at least an anterior superciliary between preocular and anterior supraocular.

¹⁸ Fitch, American Midl. Nat., vol. 20, No. 2, pp. 381–424, 1938.

Description of holotype.—Head not flattened, nearly as thick as broad; an elongate, narrow interparietal in contact with frontal; on each side a parietal, no larger than scale following; 2 frontoparietals on each side, a little smaller than parietals, the anterior broadly in contact with frontal; a pair of large prefrontals, and 2 pairs of internasals; 5 large inner supraoculars, the anterior separated from posterior internasals by contact of loreal and prefrontal; 3 small outer supraoculars, the posterior bordering orbit immediately in front of posterior supraocular of inner series, the other 2 not reaching orbit; posterior superciliaries missing, the series represented by 3 scales separating the anterior 2 outer supraoculars from orbit, and separating preocular from anterior inner supraocular; a very elongate supranasal; a single postnasal; a small lower loreal, bordered above by another loreal more than twice as large; a large preocular; two suboculars, the posterior elongate; 3 postoculars; supralabials 10–10, the last elongate, none posterior to eye higher than those anterior to eye; 3 anterior temporals.

Ten infralabials to a point even with posterior supralabial; about five pairs of chinshields, the scales of the anterior two pairs in contact medially, the remainder widely separated; a row of large labimentals, larger than the infralabials they border, separating all of chinshields, except the anterior and a narrow portion of the second, from infralabials.

Lateral fold deep, both on neck and on body; fold on neck enclosing a small, nearly scaleless pocket medially; 16 longitudinal rows of dorsals; 12 rows of ventrals; 42 dorsals from interparietal to posterior margin of thighs; 6 median rows of dorsals obtusely keeled, others smooth.

Snout to vent, 116 mm.; tail regenerated; snout to posterior border of ear 29 mm.; width of head 20 mm.; depth of head 17 mm.; hind leg 32 mm.; foreleg 26 mm.

No dark markings above or below; head reddish yellow; body brownish yellow; venter cream. No light flecks present.

Variation.—All specimens have 16 rows of dorsal scales, and all but 1 (with 14) have 12 rows of ventral scales; dorsals from occiput to base of tail 40 to 50, average 42.7 (40, 1; 41, 3; 42, 5; 43, 3; 46, 1; 50, 1). The number of keeled rows of dorsals varies from 6 to 8, and usually is 6. Two have 2–2 loreals, one has 1–2, one has 2–?, and the remainder have 1–1; in those specimens with single loreals, the scale is narrowed and otherwise so shaped that it evidently is formed by the fusion of two scales. The loreal is in contact with the prefrontal in all. Supralabials 9–10 in 1, 10–10 in 7, 10–11 in 2, 11–11 in 3. The anterior superciliary is present in all, and in all but 1 this scale completely separates the preocular from the anterior supraocular. In

1 specimen there are 4-6 superciliaries; the series is practically complete, and separates all the outer supraoculars, and all but the posterior inner supraocular, from the orbit. The others have 2 to 4 superciliaries, except in 1, on 1 side of which only the anterior superciliary is present (median fused with an outer supraocular on 1 side). One specimen has a very small azygous prefrontal.

Color.—Some specimens have faint, narrow, darker brown cross-bands, margined irregularly with flecks of white. Others have flecks of white scattered irregularly over the back and head. Otherwise the coloration is a more or less uniform, brownish yellow.

Comparisons.—This race is very similar to *levicollis*, having 16 dorsal scale rows. It differs from that in having at least an anterior superciliary (*levicollis* never has more than the median superciliary), which rarely does not separate the preocular from the anterior supraocular (preocular always contacts supraocular in *levicollis*); 2 loreals, or a single loreal formed of 2 fused scales (an obviously single, more or less rounded loreal in *levicollis*); loreal always in contact with prefrontal (loreal generally separated from prefrontal by contact of supraocular and posterior internasal); and generally fewer dorsals, varying from 40 to 50, average 42.7 (47 to 50, average 49, in *levicollis*).

There is a possibility that this is identical with a specimen described by Bocourt as *planifrons*, from "Oaxaca." If so the type probably bears incorrect locality data, as it now seems very doubtful that the species that has been known by the name of *levicollis* (including *ciliaris*) occurs on the Oaxaca highlands. *G. planifrons* moreover is said to have perfectly flat head scales, unlike all others of the *imbricatus* group. It may possibly be an aberrant specimen of some other species, such as *imbricatus*, the only other member of the group definitely recorded from the Oaxaca region. That no further specimens like the type have been collected has no bearing on the validity of the species, since the very distinct *oaxacae* also has remained a desideratum at least in the collections examined by me. In view of this doubt concerning *planifrons*, I believe it best to retain that name for a species distinct from *levicollis*; to synonymize the two would require a shift of names (since *planifrons* was the earlier named) not at all warranted by present knowledge.

KEY TO MEXICAN GERRHONOTUS

1. Arboreal species with flattened heads; dorsals with feeble or no keels, longer than broad; lateral fold poorly defined; scales on posterior surface of thigh and on sides of neck large granules; adults usually greenish; central Mexico to Panama-----*deppii* group----- 2
- Terrestrial species seldom found in trees, with thick heads not flattened although frequently widened posteriorly; temporal and supra-auricular scales never protuberant; lateral fold moderately to very well defined;

- scales on posterior surface of thigh and on sides of neck minute or not; dorsals as long as broad or broader, with well-defined keels; adults generally brown or gray----- 7
2. A series of projecting scales above ear----- 3
No projecting scales above ear----- 4
3. Scales above ear short, obtusely conical; an azygous prefrontal; central Chiapas (near Comitán)----- ochoterenai
Scales above ear very elongate; no azygous prefrontal; all scales between frontal and rostral paired; central Chiapas, Guatemala----- fimbriatus
4. Suboculars missing or reduced to minute scales; only one anterior temporal bordering orbit; central Guerrero----- deppii
Suboculars present; two anterior temporals bordering orbit----- 5
5. Area of granules on sides of neck very narrow; no granular zone in lateral fold----- oaxacae
Area of granules covering entire sides of neck; a granular zone in lateral fold----- 6
6. Dorsals larger, 25 to 29 from interparietal to posterior margin of thighs; scales across nape usually reduced to 4 or 5 in at least 1 transverse row; central Veracruz and adjacent Puebla----- gramineus
Dorsals smaller, 32 to 34 from interparietal to posterior margin of thighs; scales across nape not reduced to less than 6 in any transverse row; southern Hidalgo, central and northern Puebla----- taeniatus
7. Supranasal plates absent or fused with first pair of internasal scales; nasal in contact with rostral; a large azygous prefrontal; western Chihuahua, probably eastern Sonora----- (caerulus group)----- kingii
Supranasal plates present, small or, if enlarged, forming the second pair of scales behind rostral; nasal rarely in contact with rostral; a large azygous prefrontal or not----- 8
8. Posterior inner (usually outer also) supraocular in contact with orbit; superciliary series short, only anterior portion present (rarely posterior portion present, separating two posterior supraoculars from orbit); rarely an azygous prefrontal, minute when present; dorsals from interparietal to posterior margin of thighs 27 to 50----- imbricatus group----- 9
Posterior supraoculars separated from orbit by a complete series of supercillaries; an azygous prefrontal or not; dorsals not less than 45----- 14
9. Longitudinal rows of dorsals 14 or less----- 10
Longitudinal rows of dorsals 16----- 12
10. Dorsal scales less than 35 (27 to 29); western Mexico (State)----- rudicollis
Dorsal scales 35 to 43----- 11
11. Rows of dorsals 12; western Mexico (State), perhaps adjacent Michoacán and Guanajuato----- imbricatus adpersus
Rows of dorsals 14; Oaxaca highlands and southern edge of central plateau in Michoacán east to Veracruz----- imbricatus imbricatus
12. Only median superciliary plate present; preocular in contact with anterior supraocular; western Chihuahua, and probably adjacent areas in Sonora and Durango----- levicollis levicollis
At least an anterior as well as median, and generally a total of three supercillaries; preocular rarely in contact with anterior supraocular----- 13
13. Head scales perfectly flat (*c.f. gadovii* et al.); Oaxaca----- planifrons
Head scales convex; southern Coahuila to northern Guanajuato, central Durango to San Luis Potosí----- levicollis ciliaris
14. Two large loreals, one following the other (sometimes the posterior split into several scales); last two supralabials low, nearly straight-edged above (not angular); body and tail very elongate----- *liocephalus* group----- 20

- One loreal bordering labials, or if two one very small and split from some other scale; two posterior supralabials nearly or quite as high as antepenultimate labial at end of supraocular, and at least one of them (penultimate) angular above..... *antauges* group... 15
15. An entire postmental; scale rows 14..... 16
Only paired scales following mental; scale rows 16 or more..... 18
16. An azygous prefrontal; range unknown ("Mexico")..... *obscurus*
No azygous prefrontal..... 17
17. Supranasals small; three pairs of scales between frontal and rostral; Oaxaca highlands..... *bocourti*
Supranasals enlarged, simulating internasals, and forming a total of four pairs of scales between rostral and frontal; mountains north of Oaxaca city..... *viridiflavus*
18. No azygous prefrontal; Mount Orizaba, Veracruz..... *antauges*
An azygous prefrontal..... 19
19. Supranasals narrow, not at all enlarged; no postrostral; Oaxaca highlands and central Guerrero..... *gadovii*
Supranasals enlarged, simulating internasals; a postrostral (regular?); Mount Orizaba, Veracruz..... *modestus*
20. A loreal segmented from lower portion of "posterior canthal," which usually is separated from labials; generally two superimposed preoculars; distinct dorsal bands; belly and tail mottled with gray and with black flecks; central Veracruz, foothills (not at high elevations).... *liocephalus ophiurus*
Seldom a loreal segmented from lower portion of "posterior canthal," which rarely is not in contact with labials; generally one preocular; bands present or not; belly mottled or with black flecks but not both..... 21
21. Dorsals 46 to 52, interparietal to posterior margin of thighs; dorsal bands distinct; no black marks whatever on ventral surfaces; belly mottled (gray) in adults; northern San Luis Potosí through most of Coahuila to southwestern Texas..... *liocephalus infernalis*
Dorsals 54 to 59; dorsal bands very indistinct in adults; belly not mottled, generally uniform, sometimes with black flecks which may form broken longitudinal lines; central plateau, southern Puebla to Guanajuato
liocephalus liocephalus

4.—AN UNNAMED CELESTUS FROM MEXICO, WITH A KEY TO MAINLAND SPECIES OF THE GENUS

Material recently acquired during my tenure of the Walter Rathbone Bacon Traveling Scholarship of the Smithsonian Institution has, in conjunction with other specimens in the United States National Museum, thrown considerable light upon the status of the Mexican species of *Celestus*. In the material available and also that reported in the literature, only two Mexican forms can be distinguished. One of these has not been named, while the other has received three names.

There is another name in the literature, *Euprepis microcephalus* Hallowell,¹⁴ which was placed in *Diploglossus* (includes *Celestus*) by

¹⁴ Proc. Acad. Nat. Sci. Philadelphia, vol. 8, p. 155, 1856 (perhaps published 1857); also Trans. Amer. Philos. Soc., ser. 2, vol. 11, pp. 79-80, 1860 (reprints perhaps appeared 1857).

Boulenger.¹⁵ Hallowell's species was based on a single specimen said to be from "Mexico," collected by Keating. It is obviously not the same (by description) as the two species of *Celestus* now known from Mexico, however, and moreover Hallowell cites *Scincus ventralis* [= *Gerrhonotus liocephalus*] as a synonym. The question of its identity was submitted to Dr. E. R. Dunn, who very kindly supplied considerable additional data on the type. He states that it is not an Anguid, as *Diploglossus*, but belongs to the Scincidae. The type is not in good condition (portions of the head mutilated), but appears to belong to a non-American genus, probably *Dasia*. It may possibly be one of the original series of three specimens of Peale and Green's *Scincus ventralis*, since only two of them are now present in the series labeled as the cotypes, and thus would be explained Hallowell's citation of *Scincus ventralis* as a synonym of his species. It is also possible that a confusion of specimens occurred, the original *Gerrhonotus* being exchanged for the present type of *microcephalus*, which Hallowell erroneously thought was one of Peale and Green's cotypes. One of these alternatives must be true: Either a peculiar skink, unknown except by the type of *microcephalus*, occurs in Mexico, or else some shift of specimens occurred in the Philadelphia Academy collections between 1830 and 1856. Dr. Dunn, as well as I, favors the latter alternative. Regardless of the provenance of the type, however, it is apparent that it is not a *Diploglossus* or a *Celestus*.

CELESTUS ENNEAGRAMMUS (Cope)

- Siderolamprus enneagrammus* COPE, Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 368 (Jalapa, Veracruz).
Diploglossus steindachneri COPE, Proc. Acad. Nat. Sci. Philadelphia, 1864, p. 179 (Orizaba, Veracruz).
Diploglossus chalybaeus COPE, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 321 (Mount Orizaba, 4,000-6,000 feet, Veracruz).

The 6 specimens available include the type of *steindachneri* (U.S.N.M. No. 6342); the type of *chalybaeus* (U.S.N.M. No. 6603); two small specimens from Tequeyutepec, 7 miles above Jalapa, Veracruz (U.S.N.M. Nos. 113524-113525), which duplicate in detail the color description of *enneagrammus*, and which are practically topotypes; a juvenile from Totontepec, Oaxaca (U.S.N.M. No. 46651); and an adult from "Tehuantepec," Oaxaca (U.S.N.M. No. 30189).

Diagnosis.—The young specimens have a broad, dark brown lateral stripe on each side, extending from the snout to the sides of the base of the tail. Bordering these stripes medially is a fine light line, continuous around snout and passing through the outer supraoculars.

¹⁵ Cat. Lizards. British Mus., vol. 3, p. 504, 1887.

A similar, fine light line extends along the middle of each of the seven median dorsal scale rows, but does not extend onto head; the remainder of the back, between the light lines, is dark brown. The ventral surfaces are bluish, and the tail is bright blue (in life). The two specimens from near Jalapa, and the one from Totontepec, Oaxaca, form the basis of this description; they do not differ in pattern in any respect. The largest measures 45.2 mm. snout to vent.

The three adults or subadults (smallest 65 mm. snout to vent) retain the broad, dark lateral stripes as in the young, but the light lines on the dorsal surface increase in width at the expense of the intervening black, until the whole dorsal surface is light, with longitudinal streaks of black on the edges of the scale rows. In the smallest adult the black lines are continuous, but very narrow; in a larger adult (87.5 mm.) the black lines are broken and appear as rows of elongate spots on the edges of the scale rows; the other adult (89 mm.) is described by Cope: "Sides of head and body with limbs, black; * * * Dorsal region for a width of seven and two half rows of scales olive brown, the edges of each row blackish and forming narrow, imperfect lines * * * (this specimen, the type of *chalybaeus*, has now lost all markings)."

All specimens have rather short snouts; posterior edge of first labial even with middle of naris; supralabials to posterior edge of subocular 7-7 in 4, 7-8 in 1 (U.S.N.M. No. 113525), 8-8 in 1 (U.S.N.M. No. 113524); supralabials to below middle of eye 1 less than to posterior edge of subocular; 2 superimposed postnasals, except in 2 (U.S.N.M. Nos. 6603, 113525), in which the lower is fused with the first loreal; an anterior loreal following postnasals in all; median loreal very variable, small or fused with adjacent scales (distinct in 1; fused with lateral prefrontals in 2; fused with anterior loreal in 1; and in 2, fused with lateral prefrontal on one side, with anterior loreal on other); distance between anterior and posterior loreals considerably less than length of either; 2 superimposed posterior loreals on one side in 1, on both sides in another, 1 posterior loreal in the remainder; 1 preocular, separated from labials on one side in 1, on both sides in another; suboculars 1-1 in 1, 2-2 in 3, 2-3 in 1, indeterminate in 1; postoculars 3-4 in 1, 4-4 in 2, 4-5 in 1, 5-5 in 1; supraoculars 5-5 in all; outer supraoculars 3-3 in all; superciliaries 6-6 in 1, 7-7 in 3, 8-8 in 1, indeterminate in another; frontal anteriorly in contact with a single, azygous prefrontal, a little less than twice as long as broad; prefrontal in contact only with anterior supraocular; 3 frontoparietals on each side (an extra 1 split off frontal on one side in 1); interparietal a little smaller than either parietal, subequal to or a little larger than occipital; a small scale split from interparietal in 1 separates it from frontal;

median prefrontal in contact with the anterior internasals in 1, separating medially the scales of the posterior pair.

Scale rows 33 in 4, 35 in 2 (Nos. 46651, 113525); lamellae under terminal digits flatter than others; lamellae on fourth toe 15-16 in 2, 16-16 in 1, 17-18 in 1, 18-? in 1, indeterminate in 1.

CELESTUS ROZELLAE, new species

Holotype.—U.S.N.M. No. 113526, an adult from the vicinity of Palenque, Chiapas.

Paratypes.—Two, one from Piedras Negras, Petén, Guatemala (U.S.N.M. No. 113527); the other (U.S.N.M. No. 62992) is from an unknown locality (from fruit ship at New Orleans, La.).

Diagnosis.—Scale rows 31 to 33; frontal in contact with a single prefrontal; latter in contact with only anterior supraocular; 8 to 10 labials to posterior edge of supraocular; first labial not extending beyond anterior margin of naris; median loreal as long as either of the others, or longer; portion of rostral visible from above greater than its distance from second pair of internasals; sides dark with vertical light bars, in young and adults; young with a broad, dorsolateral light stripe on each side, fading and indistinguishable in adults.

Description of holotype.—Portion of rostral visible from above two-thirds as long (1.1 mm.) as its distance from prefrontal (1.5 mm.); two pairs of internasals; a large median prefrontal in contact with anterior supraocular and narrowly separated from anterior superciliary; width of frontal (3 mm.) two-thirds its length (4.7 mm.); interparietal subtriangular, its suture with frontal a little smaller than suture with either anterior frontoparietal; interparietal and occipital subequal in size, two-thirds size of either parietal; 3 frontoparietals, anterior largest, median smallest; nasal very elongate, nostril pierced posteriorly; 2 superimposed postnasals; 3 loreals, 2 anterior subequal in size, smaller than posterior; lateral prefrontal a little larger than median loreal, separating latter from median prefrontal; a single preocular, equal in size to anterior loreal; a short anterior and long posterior subocular; 4-5 postoculars; 8 superciliaries; 5 primary (inner) supraoculars, 3 secondary outer supraoculars; posterior edge of first labial about even with anterior border of naris; 7-8 labials to below middle of eye, 8-9 to posterior end of subocular; 1 postmental and 3 large pairs of chinshields, the scales of the anterior pair in contact medially.

Ear opening small, much smaller than eye opening; 31 scale rows around middle of body; 21-22 lamellae under fourth toe; lamellae under distal phalanx larger and flatter than others.

Snout to vent 84 mm.; snout to posterior border of ear 14.9 mm.; foreleg 19.2 mm.; hind leg 26 mm.

Color.—Head gray-brown, with a few darker brown flecks, and some of the scales edged with dark brown; sides of body and neck darker brown, with numerous, somewhat irregular, vertical light bars a little over a scale wide, and separated from each other by the width of from two to three scales; dorsal surface gray-brown as head, with small dark flecks scattered on many of the median scales; scales just above the dark sides with very few flecks; tail a little lighter than body, with longitudinal flecks of brown on the centers of the scales, particularly prominent on the two median scale rows. Ventral surfaces of body and tail bluish, except for the preanal region, a narrow area across chest, posteroventral surfaces of limbs, and midventral surface of tail, which are white.

Variation.—The adult paratype (U.S.N.M. No. 62992) is marked like the holotype. The juvenile from Piedras Negras, however, which measures 44 mm. snout to vent, is somewhat different. The sides of the body are dark and with vertical light bars as in the adults; the light bars are not quite so broad and a little more broken into spots; they extend somewhat into the dorsal region. A very broad, black band extends from the snout along the middle of the back onto the base of the tail; it covers three and two half-scale rows on the middle of the back, and on the head involves nearly all of the prefrontal and parietals. This band is separated from the lateral band by a broad light line extending from snout through the lateral supraocular region to the tail; these cover two and two half-scale rows at the middle of the body, and are greenish in the temporal region, cream on snout, and of a golden tint over most of the body. The lateral light streaks are very pale blue. Ventral surface of body rather bright blue, lighter on chin and on limbs.

There is but little variation in scutellation. In 1 the anterior superciliary is narrowly in contact with prefrontal on one side; the occipital and interparietal are half the size of the parietals in 1; median loreal fused with scale above it on one side in 1, but the distance between the anterior and posterior loreals still greater than the length of either; 7-8 superciliaries in 1; 7-8 supralabials to below middle of eye in 1, 8-9 in other (8-9, 9-10, respectively, to posterior border of subocular); scale rows 31 in 1 (No. 113527), 33 in other; lamellae under fourth toe 23-23, 26-?

Remarks.—The holotype was discovered during the day by my wife, for whom it is named. It was rapidly running up the trunk of a small tree near an open spot in a wooded area.

The species differs from *enneagrammus* chiefly in the elongate, flattened snout and different pattern. The lengthening of the snout is expressed in the larger size of the medial loreal, the elongation of the nasal, and the enlargement of the rostral.

KEY TO MAINLAND CELESTUS

1. Three prefrontals in contact with frontal¹⁶; green above, lighter on sides (adult)----- **montanus**
Only one prefrontal in contact with frontal----- 2
2. Two loreals; prefrontal in contact with two supraoculars; 6 labials to below middle of eye; a broad dorsolateral light stripe; sides uniform dark, in young----- **bivittatus**
Three or more loreals (the median may be fused with another scale, the lateral prefrontal), or, if only two, prefrontal separated from second supraocular. 3
3. Postnasals followed by two pairs of superimposed loreals; "frontal twice as wide as long; four external and four internal supraorbitals"--- **cyanochloris**
Postnasals followed by two or three loreals, not paired; frontal much longer than broad; five inner supraoculars, three outer----- 4
4. First labial reaching to middle of naris; distance between anterior and posterior loreals less than the length of either; no vertical light bars on sides in young or adults----- **enneagrammus**
First labial reaching to anterior border of naris; distance between anterior and posterior loreals practically as great as, or greater than, the length of either; vertical light bars present on sides in young and adults---- **rozellae**

5.—NEW XANTUSIID LIZARDS

The collections obtained in Mexico through the aid of the Walter Rathbone Bacon Traveling Scholarship in 1938 to 1940 have revealed the existence of two previously unknown species of *Gaigeia*, and an undescribed race of *Lepidophyma*. Specimens previously collected for the United States National Museum by E. W. Nelson and E. A. Goldman include still another unnamed race of *Lepidophyma*, making a total of four species and subspecies of each genus in Mexico.

GAIGEIA DONTOMASI, new species

Holotype.—U.S.N.M. No. 111473, an adult female from Lachiguiri, Oaxaca, at 7,100 feet, collected by Thomas MacDougall, January 20, 1940.

Paratype.—No. 111474, a topotype, same collection data as the holotype.

Diagnosis.—Dorsal whorls three to a caudal segment, ventral whorls two; scales on body of nearly equal size; no distinctly enlarged, keeled scales on thigh; four or five rows of granules middorsally; three temporals, the anterior half as large to as large as the posterior; enlarged scales in paravertebral rows separated from each other by an average of two scales.

Description of holotype.—Head and body somewhat flattened; length of portion of rostral visible from above considerably greater than its distance from frontonasal; nasals in contact medially behind

¹⁶ This is also true of *nuchalis* Boulenger (Proc. Zool. Soc. London, 1898, p. 920, pl. 56, fig. 1) from an unknown locality.

rostral; frontonasal in contact with anterior loreal; three prefrontals, the median slightly smaller than others and narrowly separated from frontonasal; two frontals, their median suture less than half their maximum length; interparietal hexagonal, longer than and as large as either parietal; temporals three, the anterior and posterior subequal in size and less than a fourth size of parietals; median temporal a little larger than or subequal to a parietal, very narrowly separated from frontal; two nasals, the nostril pierced in anterior; two loreals, the anterior not quite two-thirds size of posterior; two preoculars, lower larger, triangular; three suboculars, three postoculars and three superciliaries, all small; eight supralabials, the fifth below middle of eye; granular temporals a little larger than nuchals, somewhat irregular in size, becoming larger anteriorly; a row of small auricular lobules bordering ear.

A large mental, with a considerably larger labial border than rostral; three large pairs of scales (chinshields) following mental, the first two in contact, the posterior separated by about four scales (three to five); gular scales small, rounded, not imbricating, becoming flat and a little larger anteriorly; a rather well defined gular fold preceding arms, terminating on sides of neck, ventrally involving smaller scales than occur anteriorly.

Sides and back with small, nonimbricating scales of nearly equal size, most conical or bluntly keeled; four or five middorsal rows of small, uniform granules, bordered on either side by a series of rather widely spaced, somewhat enlarged scales separated from each other generally by two scales; on dorsolateral surface are similar, scattered, slightly enlarged scales; sides with granules of uniform size.

Thirty-two transverse rows of enlarged, flat, juxtaposed, ventral scales from gular fold to anus; 10 longitudinal rows of ventrals at middle of belly; 4 large, subequal preanals, and in addition the posterior pair bordered on either side by a scale half as large.

Dorsal surface of foreleg with small, conical tubercles, smaller on lower foreleg; ventral surface similarly protected, except that the smaller scales are on the upper foreleg, the large on the lower; lamellar formula for fingers 10-15-15-10-7.

Dorsal surface of thigh with nearly uniform, conical tubercles, shank with scales of irregular size, the larger ones bluntly keeled; ventral surface of hind leg with flat scales, largest anteriorly on shank; femoral pores 10-10; the pore series terminating medially at a large, flat scale; lamellar formula for toes 16-23-18-12-8.

Dorsal caudals feebly keeled, subcaudals smooth; on dorsal surface, every third whorl of scales slightly enlarged; first whorl of each caudal segment (i. e., that which follows the whorl of enlarged scales) incomplete ventrally.

Snout to vent 50 mm.; tail 61 mm. (regenerate); foreleg (from axilla) 15 mm.; hind leg (from base of tail) 21 mm.

Color.—Dorsal surface light gray, lighter on head; no marks on dorsal surface of latter; sides of head dark brown (black), with numerous, large, light areas in labial and lower temporal region; centers of supralabials dark; chinshields and mental with large dark areas toward border, and a smaller dark area medially; throat with a few small flecks of black; posterior temporal region and sides of body with small, scattered, round, light spots bordered by black; these spots form a more or less definite paravertebral and dorsolateral row on each side, and in these rows their dark borders expand anteriorly and posteriorly and become continuous; middorsal area unmarked; tail with similar, scattered light spots (which occupy more than half the total caudal surface), but here they are rectangular; large, light, dark-bordered ocelli occur on the limbs as well as on the body; ventral surface of body light, with some dark suffusion on the anterior edges of the belly scales, especially prominent laterally; subcaudal surface spotted (except midventrally) as dorsal surface.

Variation.—The paratype (male) is essentially similar to the holotype. The anterior temporal is half the size of the posterior; the median prefrontal is in contact with the frontonasal. There are 10–10 femoral pores.

Remarks.—The specimens are named for their collector, Thomas MacDougall, in whose company we spent several very pleasant weeks on the Isthmus of Tehuantepec. They were found under fallen logs in a pine forest.

GAIGEIA RADULA, new species

Holotype.—U.S.N.M. No. 111472, an adult female from San José Manteca, 5 kilometers from San Carlos Yautepec, Oaxaca.

Diagnosis.—Dorsal whorls three to a caudal segment, ventral whorls two; scales on body irregular in size, with many, closely placed, enlarged, keeled scales; thigh with enlarged, keeled scales; two or three rows of granules middorsally; three temporals, the anterior a third size of posterior; enlarged scales in paravertebral rows separated from each other by an average of one scale.

Description of holotype.—Similar to *dontomasi* in general features of cephalic scutellation; frontals rather narrowly in contact; a short, vertical series of somewhat enlarged scales preceding ear.

Dorsal scales mostly keeled and conical; 2 or 3 rows of granules middorsally, bordered on either side by a series of enlarged, keeled scales generally separated from each other by 1 small scale; scales on sides of body irregular; scattered, enlarged, keeled, closely placed tubercles present; many of dorsal scales of thigh enlarged, keeled; femoral pores 10–10; ventral scales 32, in 10 longitudinal series at middle of belly; lamellar formula for toes 14–20–16–10–6.

Color.—Dorsal color dark gray; sides of head darker, with vague light areas; a dark stripe through upper temporal region; dark marks on labials, mental and chinshields as in *dontomasi*; a body pattern faintly discernible, similar to that of *dontomasi*.

Remarks.—This species is obviously a close relative of *dontomasi*; it is with some hesitation that I have held the present specimen as different from the other two. The differences between *radula* and *dontomasi* are rather striking, however, in scutellation of the body, as can be seen by a comparison of the diagnoses of the two.

LEPIDOPHYMA SMITHII TEHUANAE, new subspecies

Holotype.—U.S.N.M. No. 111488, from Cerro Arenal, 30 kilometers west of Tehuantepec, Oaxaca.

Paratypes.—Eleven. U.S.N.M. No. 111489, EHT-HMS 28136, Tres, Cruces, Oaxaca; U.S.N.M. No. 111490, El Limon, Oaxaca; U.S.N.M. Nos. 111491, 111492, La Concepción, Oaxaca (all between 30 and 50 kilometers west of Tehuantepec); U.S.N.M. No. 46687, Santa Efigenia, Oaxaca; U.S.N.M. Nos. 46997 to 47000, near Tehuantepec, Oaxaca; and U.S.N.M. No. 48105, mountains near Santo Domingo, Oaxaca.

Diagnosis.—Three dorsal and two ventral whorls of small scales separating the whorls of enlarged scales on tail; femoral pores 13 or less; no median frontonasal; very young with pink tails.

Description of holotype.—Head scutellation typical, except: No median frontonasal; anterior of the three enlarged temporals small, separated from labials by a narrow row of granules and a row of somewhat enlarged scales; scales in posterior temporal region irregularly enlarged, some of the larger ones arranged in a diagonal row a little in front of ear; no enlarged scales adjoining enlarged temporals; auricular lobules prominent; granules in gular region relatively large, about nine in the vertical diameter of ear opening (at about middle of throat).

Enlarged tubercles on sides of body flattened on their posterior faces, arranged in vertical rows in which seldom more than two of the tubercles are separated on both sides from the adjacent enlarged tubercles; generally four rows of granules middorsally between paravertebral rows of enlarged tubercles.

Ten longitudinal rows of ventrals, 37 rows from gular fold to anus; 9–10 femoral pores; 75 mm. snout to vent. Three rows of small, keeled scales dorsally on tail, separating the whorls of enlarged scales; scales of whorl following the whorl of enlarged scales much reduced in size toward base of tail, proportionately equal to others only distal to about middle of tail; the latter whorl is dropped on the ventral surface, leaving 3 whorls to a segment.

Color.—Dark brown above, with small, light ocelli on body arranged in paravertebral, dorsolateral, and lateral rows on each side; belly unmarked; gular region feebly mottled; dark marks present in the center of each chinshield (infralabial) and of mental.

Variation.—The femoral pores in the 8 adult paratypes vary from 10 to 13 (10, 6; 11, 2; 12, 5; 13, 2). The 3 juveniles (largest 29 mm. snout to vent) had bright pink tails in life; after a year of preservation they appear of very light flesh color, with vague reticulations of dark pigment.

All specimens lack a median frontonasal, and largely on the basis of this character the specimens from the Tehuantepec area are distinguished from typical *smithii*. This scale is regularly present in *smithii*, as shown by a large series of 127 specimens from various localities in southern Chiapas near Escuintla. The young *smithii*, moreover, many of which were seen in life, do not have pink tails, but rather the tails are dark, as are the bodies.

LEPIDOPHYMA SMITHII OCCULOR, new subspecies

Holotype.—U.S.N.M. No. 47133, from Jalpan, Querétaro, collected by Nelson and Goldman.

Paratypes.—Two topotypes, U.S.N.M. Nos. 47134–47135.

Diagnosis.—Three dorsal and 2 ventral whorls of small scales separating the whorls of enlarged scales on tail; femoral pores less than 14 (in known specimens, 10–11); no median frontonasal; young unknown; scales anterior to ear very small and uniform, except for a row of enlarged tubercles adjacent to enlarged temporals; whorls on tail relatively poorly differentiated; most of tubercles on sides of body separated from each other; about 12 granules near middle of throat contained in vertical diameter of ear opening.

Description of holotype.—Head scutellation typical, except: No median frontonasal; anterior of the 3 enlarged temporals small, separated from labial by a single large scale nearly as large as labial; scales in front of ear (anterior to prominent auricular lobules) very small and even in size, except for a row of enlarged ones adjoining the enlarged temporals; granules in gular region very small, about 12 (at middle of throat) in the vertical diameter of ear opening.

Enlarged tubercles on sides of body flattened on their posterior faces, arranged in vertical rows in which practically all the enlarged tubercles are separated from each other; generally five rows of granular scales middorsally between paravertebral rows of enlarged scales.

Ten longitudinal rows of ventrals; 37 rows from gular fold to anus; 10–11 femoral pores; 93 mm. snout to vent.

Three whorls of small, keeled scales dorsally on tail, separating the whorls of enlarged scales; scales of whorl following the whorl of

enlarged scales much reduced in size toward base of tail; this whorl dropped on ventral surface, leaving three whorls to a segment.

Color.—Dark brown above, with large, anastomosing light spots; head light; belly, throat, and tail unmarked; chinshields with feeble dark marks.

Variation.—The two paratypes have 10 femoral pores on each side (uncertain on one side of one). Both lack a median frontonasal, and the temporal scales anterior to ear and gular scales are small, as in the type.

Comparisons.—This subspecies is similar to *tehuanae* in the absence of the median frontonasal, but it differs from that subspecies as well as from *smithii* in the small size of the temporal and gular scales, presence of a row of enlarged tubercles next to the enlarged temporals, and in the reduction in size of the scales in the enlarged tail whorls.

The 3 subspecies of *smithii* hold in common a low femoral pore count, a maximum of 4 (1 incomplete) dorsal and 3 ventral whorls to a caudal segment, and in these characters differ rather widely from *flavomaculatum*, which usually has 14 or more femoral pores and a maximum of 5 whorls (2 incomplete) to a caudal segment. In 17 typical specimens of *flavomaculatum* (Guatemala and Mexico), the median frontonasal is absent in 1, the femoral pores are 15 to 22 (15, 1; 16, 4; 17, 4; 18, 7; 19, 1; 20, 3; 22, 1), and in all the additional dorsal whorls of caudal scales are present even near the base of the tail. In 12 *f. obscurum* from Tela, Honduras, to Panama, the median frontonasal is absent in 3, and the femoral pores vary from 13 to 19 (13, 1; 14, 5; 15, 10; 16, 2; 17, 4; 18, 2; 19, 1); in the 2 Panama specimens the tail is as in typical *flavomaculatum*, while in the others the additional whorls become evident only distal to the middle of the tail.

These data seem to indicate that there is a closer relationship between *smithii*, *tehuanae*, and *oculor* than between any of them and *flavomaculatum* or *obscurum*. For this reason the former three are assumed to be races of one species, while the latter two belong to another.

KEY TO MEXICAN LEPIDOPHYMA AND GAIGEIA

1. Distinct, vertical rows, separated from each other by granular areas, of well-differentiated, enlarged, keeled scales on sides of body--- *Lepidophyma* 2
No distinct, vertical rows of enlarged scales on sides of body---- *Gaigeia* 5
2. All (except basal) whorls of enlarged scales on tail separated from each other dorsally by 4 rows of scales; femoral pores 15 to 22; median prefrontal normally present, sometimes absent; Atlantic slopes, Tabasco into Guatemala----- *flavomaculatum flavomaculatum*
All whorls of enlarged scales on tail separated from each other dorsally by 8 rows of scales (rarely feeble evidence of a fourth row); femoral pores less than 14; median prefrontal present or absent----- 3

3. A median prefrontal; Pacific slopes, Chiapas into Guatemala

smithii smithii²¹

No median prefrontal..... 4

4. Scales in posterior temporal region (anterior to ear) minute and very uniform in size, except for a series of relatively large, projecting auricular lobules and a row of larger scales beside the upper temporals; whorls on tail relatively little differentiated; Atlantic slopes, probably from southern San Luis Potosí to northern Veracruz; type locality Jalpan, Querétaro.

smithii occulor

Scales in posterior temporal region (anterior to ear) larger, irregular in size; auricular lobules poorly defined or absent; no scales bordering upper temporals; tail whorls strongly differentiated; Pacific slopes, Isthmus of Tehuantepec..... smithii tehuanae

5. All whorls on tail complete, none restricted to dorsal surface..... gaigeae
Some of scale whorls on tail restricted to dorsal surface..... 6

6. Only one row of scales on ventral surface between the whorls of enlarged scales (i. e., every third whorl restricted to dorsal surface)..... 7
Two proximally, three distally, rows of scales on ventral surface between the whorls of enlarged scales..... sylvatica

7. Numerous, very closely approximated, enlarged, keeled scales, separated by small granules, present on sides of body; two or three rows of granules in vertebral region..... radula
Dorsal scales practically uniform in size; four rows of granules in vertebral region..... dontomasi

6.—THE MEXICAN SUBSPECIES OF DRYMOBIUS MARGARITIFERUS

I first observed that very easily recognizable differences occur in Mexican *Drymobius margaritiferus* when my wife and I were collecting in the vicinity of La Esperanza, Chiapas, in April and May of 1940, as guests of Mr. and Mrs. Eizi Matuda. Although we had collected *Drymobius* in most of the provinces in Mexico where it occurs, and had never before had any hesitancy whatever in identifying *margaritiferus* as such at first sight, the specimens we collected in southern Chiapas were so different that at first we did not recognize them at all, and only after capturing several specimens did we realize they might be close to the familiar *Drymobius margaritiferus* of areas to the north.

Subsequent study of these and other Mexican specimens revealed no significant differences in scutellation, but did verify the remarkable differences in color and pattern that we had observed in the field.

²¹An overlooked synonym of *smithii* is the monotypic *Akicistops guatemalensis* Müller, Verh. Naturf. Ges. Basel, vol. 6, pp. 390-398, pls. 1-2, 1878. It is also to be noted that the "Tehuantepec" types may or may not be typical *smithii* as described and figured by Bocourt. This author mentions six specimens of his new form, four from "Tehuantepec" (Sumichrast) and two from the west coast of Guatemala. However, the species is both described and figured with a median frontonasal, and no specimens are mentioned without one. It must be concluded that the "Tehuantepec" specimens either are not from the vicinity of Tehuantepec city but from the extreme eastern part of the Isthmus (near or in Chiapas), or that the scale is actually absent, since Bocourt, paying no great attention to the presence or absence of it, neglected to specifically describe its nature. In view of the doubt concerning the nature of the "Tehuantepec" types, I believe it best to restrict the name to the form best characterized by his description and figure, and to the cotype from Guatemala, which beyond question belongs to the same race as the large series available from the vicinity of La Esperanza, Chiapas.

The southern Chiapas specimens are characterized chiefly by their dull color, which differentiates that population from all other *margaritiferus* of Central America, Mexico, and the United States. To this the name *occidentalis* Bocourt is applicable. In mature specimens of this race the light central spot of each dorsal scale (characteristic of the whole species) is gray-brown, diffuse, poorly defined, and stippled with darker. Young specimens are the same, except that the light areas are better defined. In all other mature specimens of the species, from Costa Rica to Texas, the light central spot is blue, or yellow to orange, or is partly blue and partly yellow or orange. The difference is striking, even in many long-preserved specimens (unless badly discolored by formalin).

Correlated with this color difference in *occidentalis* are two readily discernible differences in pattern. The most uniform difference, but perhaps less readily defined in words and also perhaps varying with age, is the complete absence (in mature specimens) or poor definition (in young specimens) of the dark area on the side of the head. Of all other specimens of the species this dark area is very characteristic, is well defined, and (as a key basis of comparison) is much darker than the general tone of the median dorsal nape area (equal in *occidentalis*). A more easily definable pattern difference of *occidentalis* is the complete absence of black edges on the subcaudals; the ventral surface of the tail is white, totally immaculate. Many specimens from the Atlantic slopes of Mexico and Texas have been checked for this character, and without a single exception all have the posterior edges of the subcaudals black. Frequently the belly scales are black-edged also (not or only laterally in *occidentalis*). This character, therefore, completely separates Atlantic coast Mexican and United States *margaritiferus* from *occidentalis*, but the character fails when applied to Pacific coast specimens from Tehuantepec north, in which is found the proportion of one white-tailed specimen to two banded-tailed specimens, with some specimens arbitrarily allocated to one category or the other.

Accordingly, other differences were sought, and it was then discovered that Pacific coast specimens uniformly differ from Atlantic coast specimens in having black the entire border, anterior as well as posterior, of the middorsal scales (not the extreme lateral scales). In Atlantic coast specimens the posterior border of the middorsal scales is black, but the anterior borders (from center) are blue; in discolored and young specimens, of course, the anterior borders do not appear blue, but are readily discernible as lighter and well differentiated from the jet black border of the posterior edge. The difference is not uniformly discernible in the pattern of the lateral scales, but is well defined on the middorsal scales.

Application of this character to *occidentalis* does not yield completely satisfactory results, however, for the black tips of the mid-dorsal scales shade more or less gradually into a gray, stippled posterior portion. Nevertheless, the four characters above described (1, dorsal color, light spots; 2, black areas on sides of head; 3, bands under tail; 4, individual pattern of middorsal scales) do serve to differentiate three races in Mexico: *occidentalis*, in southern Chiapas and southern Guatemala; *margaritiferus*, on Atlantic slopes from southern Texas into Central America; and an unnamed form described below as *fistulosus*, occurring from the Tehuantepec area northward on Pacific slopes to southern Sinaloa. It is of great interest that specimens from Tonalá, Chiapas, are neither *fistulosus* nor *occidentalis*, but typical *margaritiferus*. This distribution corresponds more or less with that of *Sceloporus v. variabilis*. It is the only area in Mexico where typical *margaritiferus* occurs on Pacific slopes.

In studying differences in Mexican *margaritiferus* I have largely neglected Central American specimens, some of which I realize do not conform to the present definition of typical *margaritiferus* (subcaudals not uniformly black-edged). Their dorsal color prevents any except those from southern Guatemala from inclusion with *occidentalis*, and their separation geographically from *fistulosus*, as well as the individual scale pattern (like *margaritiferus*), makes unwise association of any specimens with that race. Pending further studies, probably all Central American specimens (except *occidentalis*) should be referred to typical *margaritiferus*, with which they agree in most respects.

The Mexican specimens I have examined (about 100) can be identified easily by the accompanying key, with the exception of some juveniles (discolored) and of certain adult specimens from the Tehuantepec area, which also unfortunately are discolored by long preservation in formalin. Specimens thus discolored cannot always be definitely identified, and are best named by geographic probability.

KEY TO MEXICAN SUBSPECIES OF DRYMOBIUS MARGARITIFERUS

1. All or most of posterior edge of subcaudals dark or black..... 2
 All or most of posterior edge of subcaudals white (the subcaudal surface unmarked)..... 3
2. Anterior edges of median dorsal scales blue (in adult specimens), white (faded specimens) or gray (young specimens), the color well differentiated from a black tip of scale..... *margaritiferus*
 Anterior edges of median dorsal scales black, the color completely surrounding a light central spot..... *fistulosus*
3. Sides of head in temporal region no darker than general tone of dorsal surface of nape; light spots in centers of scales diffuse, gray-brown, stippled
 *occidentalis*

An elongated dark (black) area on either side of head behind eye, much darker than general tone of dorsal surface of nape; light spots in centers of scales well-defined, blue or tinged with orange, not or very slightly stippled
fistulosus

DRYMOBIUS MARGARITIFERUS MARGARITIFERUS (Schlegel)

Herpetodryas margaritiferus SCHLEGEL, Essai Phys. Serp., vol. 2, p. 184, 1837 (New Orleans, Louisiana, by error; here restricted to Veracruz, Veracruz).

Diagnosis.—Subcaudals black-edged posteriorly; a distinct dark (black) area in temporal region, much darker than any other part of head, darker than general tone of body anteriorly; posterior edge of each middorsal scale black, the anterior (concealed) edges blue (in adults; white in faded specimens, gray in young), middle yellow or light orange (white in faded specimens, light in young).

Specimens examined.—Forty-six from Mexico, 6 from Texas, various from Central America. Mexican localities represented by specimens examined are in the states of *Tamaulipas* (Alta Mira, Antiguo Morelos, 7 miles west of Victoria, Hda. La Clementina nr. Forlón), *San Luis Potosí* (Jilitla), *Veracruz* (Catemaco, Cuautlapan, Minatitlán, Mirador, Orizaba, San Rafael, Potrero Viejo, Tuxpan), *Tabasco* (Tenosique), *Chiapas* (El Salto and San Juanito, nr. Palenque; Tonalá), *Campeche* (Campeche), and *Yucatán* (Chichen Itzá, Puerto Morelos).

Range.—Atlantic slopes below about 4,500 feet, from extreme southern Texas into Central America; also western Chiapas, Pacific slopes.

DRYMOBIUS MARGARITIFERUS OCCIDENTALIS Bocourt

Drymobius margaritiferus occidentalis BOCOURET, Miss. Sci. Mex., Rept., p. 718, 1890 (Volcán Atitlán, Guatemala).

Diagnosis.—Subcaudal surface white, completely unmarked; sides of head in temporal region little if any darker than median parietal region, about same shade as general tone of dorsal surface on nape; central spots of dorsal scales gray-brown, diffuse, stippled; black tips of dorsal scales shading into gray posterior color.

Specimens examined.—Nine, all from the vicinity of La Esperanza (near Escuintla), Chiapas.

Range.—Pacific slopes of southern Chiapas and of Guatemala.

DRYMOBIUS MARGARITIFERUS FISTULOSUS, new subspecies

Holotype.—U.S.N.M. No. 51480, female, from Miramar, Nayarit, collected by J. C. Thompson in 1913.

Paratype.—U.S.N.M. Nos. 31480–31483, 56163, Colima; No. 30484, Tehuantepec, Oaxaca; No. 46545, Puente de Ixtla, Morelos. EHT-HMS No. 4607, Paso del Río, Colima; Nos. 4608, 5363–5365, Hda.

El Sabino, nr. Uruapan, Michoacán; No. 4613, Cuernavaca, Morelos; No. 5366, Ocotito, Guerrero; No. 23627, Tierra Colorada, Guerrero.

Diagnosis.—Subcaudals usually black-edged, but not always (about 65 percent); a distinct dark (black) area in temporal region, much darker than any other part of head, darker than general tone of body anteriorly; entire border, anterior as well as posterior, of mid-dorsal scales black, a small central area blue or yellow.

Description of holotype.—Nine supralabials, fourth and fifth entering orbit; 9–10 infralabials; ventrals 146; anal divided; tail incomplete.

Anterior part of head (in front of frontal) light brown, posterior part bluish; a large dark brown spot including temporal region, upper part of posterior supralabials, sides of parietals, and most of supraoculars; body black, with a light spot in the center of each scale; anterior spots blue, and with a small yellow center, posterior spots mostly yellow; light spots not reaching anterior border of scales except on lateral anterior scales, on all others restricted to centers of scales by a complete black border; a dark line, dimmer toward venter, marking each ventral suture; similar lines, but better defined, marking subcaudal sutures.

Specimens examined.—Besides the type series (16), 17 (discolored by formalin) from the vicinity of Tehuantepec, Oaxaca.

Range.—Pacific slopes, southern Sinaloa to the region about Tehuantepec; does not reach Tonalá, Chiapas.

7.—NOTES ON MEXICAN IMANTODES

Specimens of *Imantodes* in the Museum of Comparative Zoology, United States National Museum, and the E. H. Taylor–H. M. Smith collection, examined in preparation for a checklist and key to Mexican snakes, do not conform with current nomenclature. A number of changes appear necessary, and so that at least some of those which involve Mexican species may be available for citation, the following arrangement is presented.

I am much indebted to Dr. E. R. Dunn for very generous assistance and the benefit of his observations on Central American *Imantodes*, to Arthur Loveridge for the loan of specimens in the Museum of Comparative Zoology, and especially to Dr. E. H. Taylor for loan of specimens and for the photographs here reproduced.

IMANTODES CENCHOA LEUCOMELAS Cope

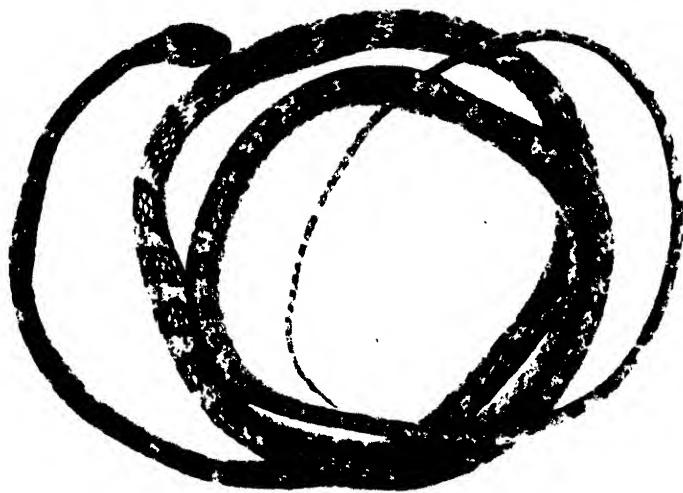
PLATE 37, FIGURE 1.

Himantodes leucomelas COPE, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 296 (Mirador, Veracruz; U.S.N.M. Nos. 25035–25036.)

Dipsas cenchoa rhombeata MÜLLER, Verh. Naturf. Ges. Basel, vol. 7, p. 151, 1882: (Guatemala).



1



2

- 1, *Imantodes cenchoa leucomelas* Cope, EHT-HMS No. 5585, from Atoyac, Veracruz.
2, *Imantodes latistratus* Cope, EHT-HMS No. 5517, from near Cuernavaca, Morelos.

Diagnosis.—Vertebral scales 3 to 4 times as broad as adjacent scales; dorsal spots on body 31 to 40; no V-shaped light mark bifurcating on posterior part of parietals, the arms reaching toward posterior corner of eyes; bands rarely broken on sides of body posteriorly.

Range.—Mexico north to central Veracruz, southern Chiapas, at least parts of Guatemala.

Specimens examined.—Twenty-two.

Remarks.—This form is easily distinguished from Central and South American *cenchoa*, and perhaps does not even intergrade with them. The differences are of a type that could conceivably show intergradation, however, and furthermore all are members of a very definite, compact morphologic group characterized by having the vertebrals three times as wide as adjacent scales, or wider, and usually two labials entering orbit.¹⁸

It appears that 3 forms are distinct: *leucomelas*, with 30 to 40 bands on body, bands not or rarely broken on sides of body posteriorly, no V-shaped light mark bifurcating on posterior part of frontal and extending toward posteromedial border of orbit; *semifasciatus*, with 40 or more bands on body, bands broken on posterior part of body and consisting of a small lateral spot widely separated from a large spot restricted to dorsal area, and head markings as in *leucomelas*; and typical *cenchoa*, with 39 or more bands on body, bands not or rarely broken on sides of body posteriorly, and a V-shaped light mark bifurcating on posterior part of parietal, usually reaching posteromedial border of orbit. The subspecies *semifasciatus* occurs from Nicaragua to Panama, and *cenchoa* from Panama to South America. I have seen no specimens of this morphologic group from Honduras, and cannot say which form occurs there. North of Honduras all specimens examined are typical and undoubted *leucomelas*, while south of Honduras all are *semifasciatus* or *cenchoa*.

IMANTODES GEMMISTRATUS Cope

Himantodes gemmistratus COPE, Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 264 (Izalco, Salvador).

Himantodes cenchoa elegans JAN and SORDELLI, Icon. Gén., livr. 38, pl. 2, fig. 1, 1871 (Central America).

Dipsas cenchoa reticulata MÜLLER, Verh. Naturf. Ges. Basel, vol. 7, p. 151, 1882 (Guatemala).

Leptognathus stratissima COPE, Proc. Amer. Philos. Soc., vol. 23, p. 280, 1886 (Panama).

¹⁸ In a letter Dr E. R. Dunn tells me that "of 291 *cenchoa* from Nicaragua, Costa Rica, and Panama, only 16 have more than two labials in orbit. Of 188 *elegans* eight have less than three labials in orbit." The proportion is higher in Mexican *leucomelas*, however, making impossible the use of this character in keys: three labials enter orbit on one or both sides in 8 out of 18 specimens.

Diagnosis.—Vertebrae enlarged, about twice width of adjacent scales; usually three labials enter orbit; bands on body numerous, 52 to 65, broken posteriorly or not.

Range.—Pacific coast of Chiapas, south to Panama.

Specimens examined.—Four.

Remarks.—This species is distinguished from all others by having most of the vertebral scales about twice as wide as the adjacent scales; they are larger than in any other species except *cenchoa*.

The name *gemmistratus* has long been used for the Mexican *Imantodes* with scarcely or not enlarged vertebrae. Even Cope eventually used it in this sense. Unfortunately, the type is missing, so it is impossible to prove what form Cope may have originally described. Fortunately, however, the type locality is definite. It is fairly certain that the name does not apply to *cenchoa*, because (1) Cope definitely says the vertebrae are relatively small, (2) he gives 42 bands on body, while 40 is the maximum for *leucomelas* (definitely known from southeastern Chiapas, therefore probably the species of Pacific coast Salvador, which is in the same faunal zone), and (3) he says the bands "are peculiar in being connected by a median dorsal vitta." The latter is a characteristic of many specimens of other species of *Imantodes*, but not of *cenchoa*.

I conceive that *gemmistratus* and *splendidus* (see below) are members of a single morphologic group (having similar ventral and caudal scale counts, similar pattern), and accordingly that one does not occur with the other. If this is true, then the species with small dorsals (*gemmistratus* auct.=*splendidus*) cannot occur in the same territory with the species with larger dorsals (*elegans* auct.=*gemmistratus*). Since the only specimens now known from the faunal area that includes Izalco, type locality of *gemmistratus*, are two¹⁹ which have the vertebral scales enlarged (as in *elegans* auct., I believe the name *gemmistratus* must be applied to that species. Unfortunately it is an older name than *elegans*, which it replaces.

While *gemmistratus* is very uniform in character of the vertebral scales, extensive variation in pattern occurs. Panama and Costa Rica specimens have the bands complete on the posterior part of the body, as well as anterior, while Nicaragua and Chiapas specimens have them broken posteriorly. The ventrals and caudals are usually low (as in Mexican *splendidus*), and vary from 220 to 237 (ventrals) and 114 to 146 (caudals). The exception is a small Nicaragua specimen with 251 ventrals and 155 caudals (U.S.N.M. No. 25248).

¹⁹ La Esperanza, Chiapas (U.S.N.M. No. 110521) and Pacific Coast of Guatemala (Brit. Mus.).

IMANTODES GRACILLIMUS (Günther)

Dipsas gracillima GÜNTHER, Biol. Centr. Amer. Rept. Batr., p. 177, pl. 53, fig. B, 1895.

Himantodes gracillimus BOULENGER, Cat. Snakes Brit. Mus., vol. 3, p. 87, 1896.

Diagnosis.—Dorsal cross bands very numerous (74 in single specimen examined), becoming broken and indistinct on posterior part of body; ventrals 244 to 253 (3 specimens).

Range.—The west coast of Mexico, presumably from Nayarit to central Guerrero. The only definite records are from Tres Marias Islands (Boulenger *loc. cit.*) and Acapulco, Guerrero (M.C.Z. No. 823).

Specimens examined.—One.

Remarks.—The apparent existence in the area between Guerrero and Nayarit of three relatively closely related species of *Imantodes* is extraordinary and invites further attention as other specimens become available. At present, however, all three species seem very well founded.

IMANTODES LATISTRATUS (Cope)

PLATE 37, FIGURE 2

Dipsas gemmistrata latistrata COPE, U. S. Nat. Mus. Bull. 32, p. 68, 1887 (Guadalajara and Valley of Toluca).

Diagnosis.—Vertebral scales not enlarged; dorsal bands 33 to 67, nearly or quite as wide laterally as dorsally, middorsally separated from each other by narrow light areas of about one scale length, none of dark bands broken laterally as in *splendidus*, but the bands becoming indistinct and sometimes indistinguishable on posterior part of body in adults (in young, the bands remain distinct on all parts of the body, but are not broken laterally); ventrals 223 to 233 (4 specimens), caudals 128 to 134.

Range.—Nayarit southward to central Guerrero.

Specimens examined.—Ten.

Remarks.—This very distinct species appears to overlap the range of *splendidus oliveri*. Records available are from Miramar (U.S.N.M. Nos. 51481–51483) and Compostela (Univ. Rochester No. 5379), *Nayarit*; ? Hda. Santa Gertrudis²⁰; Guadalajara (U.S.N.M. No. 24963), *Jalisco*; Hda. El Sabino (EHT–HMS No. 5330), *Michoacán*; Huajintlán (EHT–HMS No. 5205) and 6 miles northeast of Cuernavaca (EHT–HMS No. 5517), *Morelos*; Toluca (A.N.S.P. No. 11677) and Motajé,²¹ *Mexico*; and Chilpancingo (M.C.Z. Nos. 33651–33652), *Guerrero*.

²⁰ Boulenger, Cat. Snakes Brit. Mus., vol. 3, pp. 81–87, 1896.

²¹ Herrera, Cat. Rept. Batr. Mus. Nac. Mex., ed. 2, p. 30, 1904.

IMANTODES SPLENDIDUS SPLENDIDUS (Günther)

Dipsas splendida GÜNTHER, Biol. Centr. Amer. Rept., p. 176, pl. 56, fig. A., 1895 (Yucatán).

Imantodes splendidus SCHMIDT and ANDREWS, Field Mus. Nat. Hist., zool. ser., vol. 20, pp. 176-177, 1936.

Imantodes gemmistratus HARTWEG and OLIVER, Misc. Publ. Univ. Mich. Mus. Zool., No. 47, p. 24 (part), 1940.

Diagnosis.—Vertebrae not or scarcely enlarged, none or very few approaching twice the width of adjacent scales; usually 3 labials enter orbit; all body bands distinct, about 34 to 39, most of them much narrower laterally than dorsally, only those on posterior part of body broken laterally; ventrals 198 to 201.

Range.—Northern part of the Yucatán peninsula.

Specimens examined.—Two.

Remarks.—With the restriction of the name *gemmistratus* to a species with larger vertebral scales, *splendidus* becomes available for the Mexican species previously called *gemmistratus*. There are at least 3 races, and probably more.

IMANTODES SPLENDIDUS LUCIODORSUS Oliver

Imantodes luciodorsus OLIVER, Copela, 1942, No. 1, pp. 1-2.

Diagnosis.—Like *s. splendidus*, except: Dorsal body spots 43 to 52, average 46, broken laterally on posterior half of body; ventral 205 to 225, average 219 (14 specimens).

Range.—Coastal or lowland regions on Atlantic slopes from central Veracruz through Campeche and northern Chiapas into Guatemala, avoiding the northern half of the Yucatán peninsula.

Specimens examined.—Twelve.

Remarks.—With the definition of this race closely related to *splendidus*, and the restriction of the name *gemmistratus* to a species of *Imantodes* with distinctly enlarged vertebral scales, a new name for the Pacific coast race, closely related to *luciodorsus*, is necessary.

IMANTODES SPLENDIDUS OLIVERI, new subspecies

Dipsas gemmistrata FERRARI-PEREZ, Proc. U. S. Nat. Mus., vol. 9, p. 185, 1886 (Chiapas).—COPE, U. S. Nat. Mus. Bull. 32, p. 68, 1887 (Chiapas).

Himantodes gemmistratus SUMICHRAST, Bull. Soc. Zool. France, vol. 5, p. 184, 1890 (Tapaná [Tapanatepec], Oaxaca).—MOCQUARD, Miss. Sci. Mex., Rept., livr. 16, pp. 917-918, pl. 74, fig. 4, 1908 (Isthmus of Tehuantepec).—? WERNER, Mitt. Nat. Hist. Mus. Hamburg, vol. 28, pp. 229-230, 1909 (Hacienda de Ixtapa, Nayarit).

Imantodes gemmistratus OLIVER, Occ. Pap. Mus. Zool. Univ. Mich., No. 860, pp. 23-24, 1937 (Hacienda Albarradita, Colima); HARTWEG and OLIVER, Misc. Publ. Mus. Zool. Univ. Mich., No. 47, p. 24, 1940 (La Mixtequilla, Oaxaca).

Holotype.—M.C.Z. No. 27800, Tapanatepec, Oaxaca.

Paratypes.—Fifteen, including U.S.N.M. Nos. 12089, 32171, Mexico; Nos. 12443, 30164-30166, 30178-30179, Tehuantepec, Oaxaca; Nos.

30386-30388, Juchitán, Oaxaca; No. 110528, Tonalá, Chiapas; M.C.Z. Nos. 27799, 27801, Tapanatepec, Oaxaca; and Univ. Mich. Mus. Zool. No. 82603, La Mixtequilla, Oaxaca.

Diagnosis.—Like *splendidus splendidus* and *s. luciodorsus*, except: Ventrals 222 to 234, average 229 (16 specimens); dorsal body bands 47 to 67, average 57, broken laterally on all except about anterior third of body.

Description of holotype.—Head twice as wide as neck; portion of rostral visible from above narrow, but little shorter than distance between anterior tips of nasals; internasals a third size of prefrontals; latter narrowly in contact with supraocular; frontal pentagonal, anterior edge nearly straight, posterior angle slightly less than a right angle; length of frontal (4 mm.) a third greater than its distance from snout (3 mm.), a little longer than median suture between parietals (3.5 mm.), about two-thirds maximum length of parietals (5.5 mm.), and about a third greater than its maximum width (2.7 mm.); nasal completely divided, nares largely in anterior portion, which is much higher and a little larger than posterior part; loreal nearly square, about as high as long; a single large preocular; postoculars 2-3, upper much the largest; temporals 1-2-3; supralabials 8-8, sixth largest, third, fourth, and fifth entering orbit; infralabials 10-10, five in contact with anterior chinshields, 2 (fifth and sixth) with posterior; chinshields nearly subequal in size, posterior a little shorter than anterior and separated from each other medially by a series of small scales; 3 small scales between chinshields and first enlarged ventral.

Dorsal scales in 17-17-15 rows, smooth, with 1 or 2 apical pits; vertebral scales somewhat wider than others; ventrals 222; subcaudals 127; anal divided; total length 774 mm., tail 230 mm., female.

Color.—Ground color light brown, stippled; a series of 58 cross bands on body extending to edges of ventrals, and covering about $1\frac{1}{2}$ to $2\frac{1}{2}$ scale lengths middorsally; spaces between anterior bands a little less than length of bands middorsally, but increasing in size posteriorly, the posterior bands separated by spaces which may be as much as $1\frac{1}{2}$ times as long as the bands themselves; a very irregular, broken, narrow, dark streak on middorsal line between bands; bands a little narrower on sides than middorsally; anterior 20 bands unbroken laterally, but the twenty-first and all posterior bands are broken laterally on the left side (at seventy-ninth ventral), while on the right side the twenty-fourth band is the most anterior broken band (at ninety-first ventral); the lateral break in the bands becomes much greater posteriorly so that there remains on the posterior part of the body a median series of large spots, extending laterally to the fifth scale row, separated from a lateral series of smaller, poorly defined spots involving the two edges of the ventrals and the first and

second scale rows; the dorsal spots coincide in position with the lateral spots throughout the body.

Dorsal spots on tail about 38, becoming smaller and less distinct distally; large, dark brown stipple marks on belly and subcaudal surface, except on neck, chin and gular region, which are immaculate.

TABLE 2.—*Variation in Imantodes s. oliveri*

Number	Sex	Ventrals	Caudals	Supralabials	Labials enter eye	Body spots
12443-----	♀	230	125	8-8	3-4-5	54
30164-----	♀	229	117	8-8	4-5	59
30165-----	♀	229	118	8-8	4-5	67
30166-----	♀	234	-----	8-8	4-5	52
30178-----	♀	227	130	8-8	3-4-5	58
30179-----	♀	226	-----	8-8	3-4-5	47
30386-----	♀	224	-----	6-8	4-5	47
30387-----	♀	222	130	8-8	4-5	59
110528-----	♀	226	121	8-8	3-4-5	55
27799-----	♀	227	-----	8-8	3-4-5	61
27800-----	♀	222	127	8-8	3-4-5	58
Oliver-----	♀	231	133	8-8	-----	67
Werner-----	♀	230	117	-----	-----	50
30388-----	♂	235	-----	8-8	3-4-5	60
27801-----	♂	234	137	8-8	3-4-5	67
82603-----	♂	230	134	9-9	-----	-----

Range.—Pacific lowlands from western Chiapas northward, probably to Nayarit. Definite records, however, are lacking for the area between central Oaxaca and Colima.

Remarks.—Werner's record from Nayarit may not be referable to this race; it possibly should be referred to *latistratus*.

The species is named for Dr. James A. Oliver, in recognition of his studies on the genus.

IMANTODES TENUISSIMUS Cope

Himantodes tenuissimus COPE, Proc. Acad. Nat. Sci. Philadelphia, 1866, p. 317 (Yucatán).

Imantodes gemmistratus SCHMIDT and ANDREWS, Field Mus. Nat. Hist., zool. ser., vol. 20, pp. 177-178, 1936.

Imantodes tenuissimus HARTWEG and OLIVER, Misc. Publ. Univ. Mich. Mus. Zool., no. 47, p. 24, 1940.

Diagnosis.—Vertebrals not at all enlarged; caudals 143 to 158; ventrals 240 to 252; bands well defined throughout body, not or rarely broken posteriorly, separated from each other by about half their length or more.

Range.—Yucatán.

Specimens examined.—Two.

KEY TO MEXICAN IMANTODES

1. Vertebral scales greatly enlarged, three to four times as wide as adjacent dorsals; bands symmetrical, usually not broken on sides of body posteriorly. *cenchoa leucomelas*
 Vertebral scales not enlarged or at most about twice as wide as adjacent scales----- 2
2. Ventrals 240 or more----- 3
 Ventrals 236 or fewer----- 4
3. Posterior dark bands on body broken laterally, poorly defined; spaces between anterior cross bars less than one scale length----- *gracillimus*
 Bands distinct and symmetrical over all of body, usually none broken on sides of body, all involving ends of ventrals or subcaudals; spaces between cross-bands half the length of the bands, or greater----- *tenuissimus*
4. Vertebrals about twice as wide as adjacent scales----- *gemmastratus*
 Vertebrals not or but slightly enlarged, not twice as wide as adjacent dorsals ----- 5
5. Bands with nearly straight anterior and posterior edges, very little if any narrower laterally than dorsally; bands not broken on sides of body, but becoming much less distinct toward tail, sometimes indistinguishable; ventrals 223 to 233----- *latistratus*
 Bands narrower on sides of body than on middorsum, at least the posterior ones broken laterally, and all very distinct and not becoming notably fainter toward tail----- 6
6. Body bands 34 to 39, only those on extreme posterior part of body broken laterally; ventrals 198 to 201----- *splendidus splendidus*
 Body bands 43 or more, broken laterally on at least posterior half of body, sometimes on posterior two-thirds; ventrals 205 or more----- 7
7. Body bands 47 to 67, average 57, broken laterally on all except anterior third of body; ventrals 222 to 235, average 229----- *splendidus oliveri*
 Body bands 43 to 52, average 46, broken laterally only on posterior half of body; ventrals 205 to 225, average 219----- *splendidus luciodorsus*

8.—TWO NEW SNAKES OF THE GENUS CLELIA

Among the very important discoveries of Dyfrig McH. Forbes of Potrero Viejo, Veracruz, is a rare specimen, generously presented to me in 1939, belonging to the *pethola* group of *Clelia*. This is the third known from Mexico, and apparently the first in American collections. Its characters do not agree with those of Central American specimens, and no name for it is available. It is a pleasure to associate with it the name of Dr. Joseph R. Bailey, in whose hands the genus is in the process of intensive study.

CLELIA BAILEYI, new species

Holotype.—U.S.N.M. No. 111261, female, from Potrero Viejo, Veracruz, collected by Dyfrig McH. Forbes.

Diagnosis.—Subcaudals divided; supralabials eight; preocular in contact with frontal; ventrals 191, caudals 89 in type; 23 crossbands on body, 13 on tail, in type; body bands covering four to five scale

lengths, separated from each other by red spaces of nearly equal size; all except anterior 4 or 5 red interspaces with most of the scales spotted (black-tipped or bases black); first black band (nape) covering about 8 scale lengths; yellow nuchal collar covering three scale lengths mid-dorsally, laterally extending only to posterior portion of seventh supralabials; remainder of sides and top of head black.

Description of holotype.—Rostral broader than high; length of portion visible from above three-fourths length of internasal suture; internasal two-fifths size of prefrontals, quadrangular; prefrontals extending well onto sides of head, the greatest extension a point between loreal and preocular; frontal pentagonal, the lateral and posterolateral sides meeting in a broad curve; length of frontal (5 mm.) slightly less than its distance from tip of snout (5.5 mm.) nearly as great as greatest length of parietal (6 mm.); nasal large, completely divided, naris large and centrally placed, anterior section larger than posterior and wedged between first labial and rostral; loreal twice as long as broad; preocular single, nearly as large as supraocular, in contact with frontal and with one (two) labials, much narrower below than above; two postoculars, lower smaller; temporals 2-2 (2-3), the sixth labial narrowly in contact with upper primary temporal; eight supralabials, sixth and seventh subequal and larger than others, fourth and fifth (third also, narrowly, on one side) entering orbit; eye small, its diameter (2.8 mm.) about half its distance from tip of snout (5.8 mm.); ten infralabials, sixth largest, five in contact with anterior chin-shields; latter a little larger than posterior, which are narrowly separated from each other.

Dorsal scales in 19-19-17 rows, smooth, with 2 large apical pits; ventrals 191; anal single; caudals 89. Total length 700 mm., tail 173 mm.

Maxilla with 15 teeth, the 2 posterior somewhat enlarged, and with a deep groove on anterior face; other teeth ungrooved; the anterior ones strongly recurved and a little larger than posterior teeth (of ungrooved series).

Color.—Top and sides of head uniform black, this color extending laterally to posterior border of seventh supralabial, medially a little beyond end of parietals; this bordered by a yellow nuchal collar with a straight posterior border, covering about 3 scale lengths medially; follows a series of 23 crossbands on body, 13 on tail; bands shorter on posterior part of body than on anterior, all a little shorter laterally than medially; first band covering about 8 scale lengths, others 6 to $3\frac{1}{2}$ scale lengths, decreasing posteriorly; these bands involving ends of ventrals; red spaces between black bands nearly equal size of latter; anterior red space without black (a few tiny flecks); succeeding 3 species with numerous, small flecks; succeeding 2 with the tip of

each scale black, and some larger dark marks medially; remainder of red interspaces with numerous black spots, smaller than a scale, at tips or bases of scales.

Infralabial and lateral gular region with poorly defined, small black spots and fine black stippling; belly cream, unmarked save at ends of ventrals (black spotted, bands also encroaching); ventral surface of tail largely black, with irregular light areas and edges of caudals light, giving a mottled (not at all banded) appearance.

Remarks.—The present species' nearest relative appears to be that described by Cope²² as *Oxyrhopus doliatus semicinctus*, the type of which is U.S.N.M. No. 28900, from Sipurio, Costa Rica. Conspecific with this are 4 others in the National Museum from Honduras (Segovia River, No. 24533), Nicaragua (Escondido River, No. 19744) and Panama (Cana, No. 50111; Ancón, C. Z., No. 65867). These specimens show the following differences from *baileyi*: (1) ventrals more numerous, 200 to 209 (191, *baileyi*), caudals more numerous, 92 to 111 (89, *baileyi*); (2) very little or no black spotting on light scales (a great deal in *baileyi*); (3) ventral surface of tail banded, as dorsal surface (mottled in *baileyi*); (4) interspaces between black bands yellow (posteriorly red?) (all red in *baileyi*, except yellow nuchal collar); (5) nuchal collar usually (not in 1) involving posterior ends of parietals, nearly to eye laterally, covering 5 to 8 scale lengths on nape (not involving parietals, not reaching primary temporals laterally, covering 3 scale lengths on nape); (6) first spot on body longer, covering 10 to 16 scale lengths (8 scale lengths in *baileyi*).

So far as I am aware, the only other specimens of this group known from Mexico are two recorded by Boulenger²³ from "Mexico" and Atoyac, Guerrero. The latter very likely is different from *baileyi*, not only because it has more numerous ventrals (204) but primarily because it is from an entirely different faunal province.

This species is not *pethola* Linnaeus, since this name (*vide* Boulenger, *op. cit.*, p. 102) refers to South American specimens with 50 to 75 crossbands; the type of *baileyi* moreover does not fit the descriptions given by Linnaeus of the 9 varieties of *pethola*. The pattern description of *petalarius* Linnaeus does fit the characters of *baileyi*, however, in the few details mentioned; I do not believe the name refers to the Mexican form, however, since the ventrals and caudals are perhaps too numerous (212, 102, respectively), and the type locality is given as "South America" and "India" (latter by error).

Oxyrhopus doliatus aequifasciata Werner from Cobán, Guatemala, does not seem to be the same. It has 207 ventrals and 78 subcaudals, the underside uniform yellow, the light spaces between the dorsal bands not dark-spotted.

²² U. S. Nat. Mus. Bull. 32, p. 76, 1887.

²³ Cat. Snakes Brit. Mus., vol. 3, p. 103, 1896.

Remarks.—The only two specimens of *Clelia clelia* examined from the Pacific slopes of Mexico north of the Isthmus of Tehuantepec are markedly different from other Mexican specimens in lacking dark spots at the tips of the dorsal scales. They are named:

CLELIA CLELIA IMMACULATA, new subspecies

Holotype.—U.S.N.M. No. 24966, from "Guadalajara," Jalisco, collected by J. J. Major.

Paratype.—EHT-HMS No. 4568 from Paso del Río, Colima.

Diagnosis.—Like *Clelia clelia*, except no dark spots present on tips of dorsal scales.

Description of holotype.—Supralabials 7-7; infralabials 8-8; posterior section of nasal elongate; a small loreal; 1 preocular; 2 postoculars; temporals, 2-3; dorsals 19-19-17 rows; ventrals 206; anal entire; subcaudals 78. Total length 595 mm.; tail 118 mm.; male.

Top of head dark brown, about to middle of parietals, the posterior edge irregular; nape and posterior part of head white; an area on nape, beginning three scale lengths behind parietals, dark brown, the color extending posteriorly about eight scale lengths, then becoming diffuse and disappearing; remainder of dorsal surface light, cream (red in life), without any dark marks whatever; ventral surfaces of head, body and tail white.

Variation.—The only other specimen seen from the Pacific slopes of Mexico north of the Isthmus of Tehuantepec is a specimen I collected at Paso del Río, Colima. It also lacks dark spots at the tips of the scales. "Ventrals, 211; caudals, 86; upper labials, 7-7; lower labials, 8-8; preoculars, 1-1; postoculars, 2-2; temporals, 2-3; anal single; scale formula 24, 21, 17, 17, 17; preocular separated from frontal; parietals shorter than their distance to end of snout; frontal about equal to its distance to end of snout. Eye (3 mm.) shorter than distance between eye and nostril (3.6 mm.); loreal higher than long; length 675 mm.; tail, 147 mm.; head width, 12 mm.; length, 19.6 mm. Head dark violet to violet-black; cream collar behind parietals 4 scale-rows wide; large blackish violet band behind collar."²⁴

Comparisons.—Nine specimens of *Clelia clelia clelia* from Chiapas, the Isthmus of Tehuantepec, and Veracruz all have the dorsal scales black-tipped. The black tips are visible even in adult specimens.

9.—ADDITIONAL NOTES ON CONOPHIS

In a recent paper on *Conophis*²⁵ I overlooked the notice by Dunn²⁶ of a new species, *C. nevermanni*, from Costa Rica. The

²⁴ Taylor and Smith, *Kans. Univ. Sci. Bull.*, vol. 25, p. 258, 1938.

²⁵ *Jour. Washington Acad. Sci.*, vol. 31, No. 3, pp. 117-124, 1941.

²⁶ *Copeia*, 1937, No. 4, p. 214, 1938.

latter is a species I have not seen, and it is not represented in the collection of the United States National Museum. It possibly belongs in the group with *pulcher* and *lineatus*, since it has eight supralabials and presumably the first scale row pigmented. It seems closest to *pulcher*, of which it could conceivably be a race. It certainly is a species different from *lineatus*, which also occurs in Costa Rica.

The Central American subspecies of *lineatus*, which I named *similis*, cannot stand, since it is a homonym of *Conophis pulcher similis* Bocourt.²⁷ I suggest the name *dunni* for the southern race; its type (that of *similis* Smith) is U.S.N.M. No. 79963, from Managua, Nicaragua.

Unfortunately Bocourt's *pulcher similis* was described without citation of the type locality, and many details of its pattern are not mentioned. However, in several respects it agrees with *C. pulcher plagosus*, which I described on the basis of a single specimen from Tonalá, Chiapas (U.S.N.M. No. 109707). Although absolute certainty of the identity of Bocourt's specimen can be obtained only by reexamination of the type, it appears probable that *plagosus* Smith and *similis* Bocourt are identical.

The species of the genus accordingly stand as follows:

Conophis vittatus vittatus Peters

Conophis vittatus viduus Cope

Conophis pulcher pulcher Cope

Conophis pulcher similis Bocourt

Conophis nevermanni Dunn

Conophis lineatus lineatus (Duméril and Bibron)

Conophis lineatus concolor Cope

Conophis lineatus dunni Smith.

²⁷ *Miss. Sci. Mex.*, Rept., livr. 10, 1886, pp. 643-4.



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REVISION OF THE GENUS *Phloeosinus* CHAPUIS IN NORTH AMERICA (COLEOPTERA, SCOLYTIDAE)

BY M. W. BLACKMAN

INTRODUCTION

THE genus *Phloeosinus* Chapuis is one of the most widely distributed genera of bark beetles, as it occurs in all the large continental land masses and in many islands. Although the genus is not so large, as regards the total number of recognized species, as are several other genera, in North America it appears to be second only to *Pityophthorus* in the number of known species. In the present paper, which deals with all North American forms from Alaska to Mexico inclusive, 45 species, including 16 previously undescribed ones, are recognized as valid. Thorough collecting in Mexico and Alaska would, without doubt, bring to light additional species.

All but three of the known North American species of *Phloeosinus* breed in the inner bark of cupressine and taxodiine trees of the genera *Sequoia*, *Taxodium*, *Libocedrus*, *Thuja*, *Cupressus*, *Chamaecyparis*, and *Juniperus*. Of the three nonconforming species one breeds in *Pinus* and two in *Picea*. Although plainly congeneric, these three species differ from the others not only in host selection but also in certain evident morphological characters that serve as a basis of primary separation.

The breeding habits of the species do not differ greatly from those of many other bark beetles. The brood burrows are constructed in the inner bark, often grooving the surface of the sapwood rather deeply. The burrow usually consists of a simple longitudinal egg

gallery, in each side of which the eggs are placed in closely spaced egg niches. The larval mines extend out at each side, more or less at right angles to the egg gallery. Each egg gallery is the product of a pair of beetles. In some species at least, the male remains on guard in the entrance gallery, often dying in that position.

In all cases where the habits are known, the young adults at the time of emergence from the old host are sexually immature and must feed for some time before attacking a new host. In some cases they clip off and eat the tender leaflets, thus partially defoliating healthy trees. The young adults derive most of their food, however, by boring into the twigs of vigorous trees and gouging out most of the sapwood. This causes the twigs to wilt and die. Sometimes they break off entirely and fall to the ground, but more often the wilted twigs remain attached by a few shreds of bark and wood.

This feeding of the newly emerged adults produces effects which are always very evident and often excessive in areas where the beetles are more than usually numerous. Even under conditions of nature such as in the semidesert areas of the Southwest, where junipers are among the few tree species able to survive, the wilted and broken twigs are very common and conspicuous. In areas where cupressine trees are often used as ornamentals, the feeding injuries may be so numerous as to detract from their beauty. In some cases such feeding activities kill so many twigs as entirely to ruin the appearance of an evergreen hedge or of a specimen tree. This is especially true in many areas in California and Arizona.

While the twig feeding of the adults is responsible for most of the damage inflicted by species of *Phloeosinus*, their breeding activities also cause considerable injury under certain conditions. Most of the species are not at all aggressive in their attacks on trees but by preference enter the bark of dying, weakened, felled, or broken trees or portions of trees. However, when the beetles in flight in an area are particularly numerous, trees which appear healthy may be attacked and killed. Fatal attacks on several species of cypress in California by *P. cupressi* Hopkins and *P. cristatus* (LeConte) and by the latter species also in the Gila Valley of Arizona, have been numerous. It is possible that species of *Cupressus* are more susceptible to attack than are species of other related genera, for in the vicinity of Mexico City *P. baumanni* Hopkins and *P. tacubayae* Hopkins attack the same tree and are known to be serious enemies of the local species of cypress.

It is true, perhaps, that if most cases of killing caused by attacks of *Phloeosinus* upon apparently healthy trees were examined critically it would be found that such trees had been weakened by drought or other causes. The trees' resistance to attack had been lessened

even though they still appeared vigorous. Some such trees would die even though not attacked by insects, but many would probably survive.

The western half of the country, with its numerous species of trees favored by *Phloeosinus*, is especially rich in species of the genus. Of the 40 species known to occur in the United States and Canada, 35 are found in the western half and only 5 in the eastern half. The Pacific Coast States are especially rich in this group, both as to number of species and number of individuals.

I am very grateful for the hearty cooperation of the western field men of the Division of Forest Insect Investigations of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, in furnishing much of the material on which this study is based. Without the thousands of specimens from the collections of the several field stations, no thorough study of the genus would have been possible. I am, therefore, under great obligations to J. M. Miller, of the Berkeley, Calif., laboratory; F. P. Keen, of the Portland, Oreg., laboratory; J. C. Evenden, of the Coeur d'Alene, Idaho, station; and R. L. Furniss and Donald DeLeon, of the Fort Collins, Colo., station; and to the men working with them for this indispensable assistance.

Sincere thanks are also extended to W. J. Chamberlin, of Oregon State College, Corvallis, Oreg., for the loan of his specimens of *Phloeosinus*, including several paratypes; to J. E. Knull, of Ohio State University, for his collection of the genus, including paratypes of *granulatus* Bruck and *variolatus* Bruck; and to Donald DeLeon, of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, for his private collection taken in the Southwestern States and in Mexico. I wish also to thank most cordially P. J. Darlington, Jr., of the Museum of Comparative Zoology of Harvard University, Cambridge, Mass., for his kindness and painstaking care in comparing specimens sent for that purpose with the type of *P. serratus* (LeConte).

Genus *PHLOEOSINUS* Chapuis

Phloeosinus CHAPUIS, Synopsis des Scolytides, p. 37, 1869; Extr. Mem. Soc. Roy. Sci. Liège, p. 245, 1873.—LECONTE, Proc. Amer. Philos. Soc. vol. 15, p. 381, 1876.—EICHHOFF, European Borkenkäfer, p. 131, 1881.—LECONTE and HORN, Coleop. North Amer., p. 523, 1883.—BEDEL, Fauna Coleop. Seine, vol. 6, p. 389, 1888.—REITTER, Verh. Naturf. Ver. in Brünn, vol. 33, p. 49, 1894.—BLANDFORD, Trans. Ent. Soc. London, 1894, p. 68; Biol. Centr. Amer., Coleop., vol. 4, pt. 6, p. 160, 1897.—BARBEY, Scolytidae l'Europ. Cent., p. 58, 1901.—SWAINE, New York State Mus. Bull. 134, p. 128, 1909.—HOPKINS, Proc. U. S. Nat. Mus., vol. 48, p. 126, 1914.—SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, pp. 67-70, 1918.—BLACKMAN, Mississippi Agr. Expt. Sta. Techn. Bull. 11, pp. 59-61, 1922.—W. J. CHAMBERLIN, Bark and timber beetles of North America, pp. 168-182, 1939.

Generic description.—Body stout, oval, strongly convex, ornamented with hairs and scales; frons convex, often weakly impressed in female, concave or strongly impressed in male; eyes strongly emarginate; antenna with funicle 5-segmented, with outer segments wider, club elongate, compressed, with three more or less oblique sutures; pronotum wider than long, posterior outline bisinuate; prosternum moderately short; fore coxae moderately widely separated; elytra with anterior margins arcuate, serrate; striae distinctly, often strongly, impressed, always narrower (often much narrower) than interspaces; declivity with alternate interspaces, especially in male, more strongly asperate or serrate, second interspace often devoid of serrations.

Genotype.—*Hylesinus thujae* Perris from France, designated by Hopkins, 1914.

KEY TO NORTH AMERICAN SPECIES OF PHLOEOSINUS CHAPUIS

1. Frontal rectangle¹ of male nearly or quite as long as wide; that of female 0.8 to 0.9 as long as wide; epistomal lobe narrow, moderately long; mesosternum precipitous and protuberant between coxae; elytral declivity with all interspaces convex and subequally asperate in both sexes; breeding in pines or spruces..... 2
- Frontal rectangle of male from 0.6 to 0.8 as long as wide, that of female wider; epistomal lobe small or nearly absent; mesosternum varying from precipitous to flat between coxae, never protuberant; elytral declivity with second interspaces either flat or much less convex than others, asperities absent in male at least; breeding in taxodine or cupressine trees..... 4
2. Width of frontal concavity of male less than half distance between eyes; pronotal disk and sides distinctly granulate-punctate; breeding in pines; Manitoba and Michigan... *pini* Swaine (p. 407)
- Width of frontal concavity of male half or more distance between eyes; pronotal disk punctate, sides subgranulate-punctate; breeding in spruce..... 3
3. Pronotum in female slightly longer than wide, wider than long in male; Quebec, in white spruce..... *piceae* Swaine (p. 408)
- Pronotum distinctly wider than long in both sexes; Alaska, in white spruce..... *alaskanus*, new species (p. 409)
4. Second interspace on elytral declivity narrower than (or at most subequal to) first or third, never serrate in either sex; elytral vestiture either abundant or nearly absent..... 5
- Second interspace on elytral declivity as wide as first or third, not serrate in males, often serrate in females, elytral vestiture rather abundant..... 31
5. Usually small species, averaging slightly more or less than 2.0 mm. long (except *keeni*); mesosternum precipitous or steeply oblique between coxae; vestiture of pronotum and elytra usually rather abundant and distinct..... 6

¹The width of the frontal rectangle is the distance between the inner margins of the eyes. Its length is the distance between a line connecting the upper margins of the eyes and a line parallel to it and touching the lower edge of the epistomal process.

- Usually larger species (2.0 to 4.5 mm. long); mesosternum ranging from flat to moderately oblique between coxae; vestiture of pronotum and elytra usually scanty except sometimes on declivity..... 16
6. Frons deeply concave in male; elytral vestiture rather fine and abundant on disk and sides; declivity with second interspace narrower than first or third, vestiture abundant on all declivital interspaces..... 7
- Frons rather shallowly concave in male; elytral vestiture rather coarse and scanty on disk and sides; declivity with second interspace scarcely narrower than first or third, with obsolescent punctures and without vestiture, first and third interspaces with dense white scales..... 15
7. Elytra of male more than 1.30 times as long as wide, interspaces not twice as wide as striae; first and third interspaces on declivity with coarse, short, stout, closely placed, recurved serrations..... 8
- Elytra of male less than 1.30 times as long as wide (except in *antennatus*), interspaces more than twice as wide as striae; first and third interspaces on declivity sparsely armed with either rather small or with slender, sharp serrations..... 9
8. Frons of male rather narrowly concave, with distinct, elevated carina on lower half; frons of female granulate-punctate throughout; second declivital interspace much narrower than third; California, in *Libocedrus*, *Juniperus*, and *Cupressus*.
hoppingi Swaine (p. 411)
- Frons of male widely concave, carina reduced to tooth on epistoma; frons of female punctate above, feebly granulate at sides only; second declivital interspace only slightly narrower than third; Arizona to Texas and Wyoming, in *Juniperus*..... hoferi, new species (p. 412)
9. Declivital serrations on first and third interspaces rather blunt in male, somewhat smaller in female; declivity in both male and female with dense coat of yellowish scalelike hairs..... 10
- Declivital serrations on first and third interspaces in males sparse, large to moderately large, with apices sharp, much smaller in females; hairs moderately abundant in female at least..... 12
10. Notably larger (2.15 to 2.8 mm. long); frons of male deeply and widely concave, with carina moderately elevated on less than lower half; elytral striae narrow, with small, rather close punctures; Washington, in *Chamaecyparis nootkensis* (Lamb.) Sudw..... keeni, new species (p. 414)
- Notably smaller (1.6 to 2.0 mm. long); frontal concavity of male moderately deep, rather narrow, with strong, sharply elevated carina on more than lower half; elytral striae moderately narrow, striae punctures larger and not closely spaced; declivital serrations small..... 11
11. Frons of male granulate-punctate at sides and above concavity; pronotum deeply, closely, moderately coarsely punctured, with short, fine hairs; California and Oregon, in *Libocedrus decurrens* Torrey..... antennatus Swaine (p. 415)

- Elytral declivity with first and third interspaces in both sexes distinctly serrate, second interspace plainly narrower than first or third----- 20
18. Smaller (1.8 to 2.25 mm. long); pronotum with small, moderately sparse punctures; elytral striae with very fine punctures, interspaces punctate and with only a few very fine granules; declivity with first and third interspaces weakly convex, each with a few minute, obsolescent granules.
vandykei Swaine (p. 425)
- Larger (2.0 to 2.8 mm. long); pronotum with moderately coarse, close punctures; elytral striae with moderately large punctures; interspaces densely, moderately coarsely granulate-punctate; declivity with interspaces 1 and 3 strongly convex, with a few small granules----- 19
19. Black throughout; frons strongly granulate-punctate throughout, including shallow concavity; pronotum with dense, deep punctures; elytra black, interspaces very densely, rather coarsely granulate; second declivital interspace subequal in width to first or third----- fulgens Swaine (p. 427)
- Black, with elytra reddish brown; frons granulate-punctate at sides, punctate above; pronotum with close, deep punctures; elytra reddish brown, moderately densely, less coarsely granulate; second declivital interspace slightly but distinctly narrower than first or third----- splendens, new species (p. 428)
20. Elytra brilliantly shining, appearing glabrous on disk and sides, but with scanty, minute hairs, striae but little narrower than interspaces, with coarse, shallow punctures; declivity with second interspace impunctate and bare of hairs in male; third interspace strongly elevated and closely, coarsely serrate.
punctatus LeConte (p. 429)
- Elytra a little less brightly shining, with moderately scanty, fine, short (but not minute) hairs on disk and sides, striae distinctly narrower than interspaces, with notably smaller punctures; declivity with second interspace sparsely to very sparsely punctured in male, with few or many hairs; third interspace moderately elevated, with serrations moderately small and sparse----- 21
21. Frontal concavity of male more than half as wide as distance between eyes; pronotum with discal punctures similar throughout, with much longer, stouter hairs at each side; elytra with interspaces about 1.5 times as wide as striae; declivity of female densely clothed with hairs and scales; first interspace of male with very sparse serrations.
rubicundulus Swaine (p. 431)
- Frontal concavity of male less than half as wide as distance between eyes; pronotum with punctures notably smaller and closer in median line than elsewhere on disk, hairs not much longer or stouter at sides; elytra with interspaces twice as wide as striae; declivity of female rather thinly clothed with hairs or scales----- 22
22. Smaller (1.9 to 2.3 mm. long); elytral declivity of both sexes devoid of scalelike hairs----- buckhorni, new species (p. 432)
- Larger (2.14 to 3.1 mm. long); elytral declivity of female with scalelike hairs----- 23

23. Frons of male rather coarse granulate-punctate at sides and above, median carina rather short, one-third of diameter of deep concavity; declivity of female with rather wide, scalelike hairs----- *kaniksu*, new species (p. 434)
- Frons of male finely granulate-punctate at sides, punctate above, median carina long, two-thirds of diameter of rather shallow concavity; declivity of female with rather narrow scalelike hairs----- *rusti*, new species (p. 435)
24. Elytral striae moderately wide to very wide, with rather coarse to very coarse punctures; female with first and third declivital interspaces subequally, strongly serrate; male with first interspace coarsely serrate only at top of declivity, unarmed below----- 25
- Elytral striae narrow to very narrow, with small, indistinct punctures; female with third declivital interspace much more strongly elevated and serrate than first; male with first declivital interspace devoid of coarse serrations----- 28
25. Elytral interspaces equal or subequal to striae in width, striae punctures very coarse, declivity rather densely clothed with hairs and scales in both sexes, serrations of first and third interspaces very coarse----- 28
- Elytral interspaces distinctly wider than striae, striae punctures moderately large; declivity with few hairs in male at least, serrations moderately coarse on first and third interspaces----- 27
26. Male slightly more than twice as long as wide; frontal carina moderately elevated on epistoma; elytral interspaces rather strongly rugose-granulate-punctate; discal vestiture moderately sparse and short; Mexico, in *Cupressus* sp.
baumanni Hopkins (p. 437)
- Male slightly less than twice as long as wide; frontal carina very strongly elevated on epistoma; elytral interspaces very strongly rugose-granulate-punctate; discal vestiture more abundant and longer; California, in *Cupressus sargentii*.
variolatus Bruck (p. 438)
27. Elytra with discal striae and lateral outlines slightly sinuate, broadly impressed across dorsum, lateral interspaces nearly smooth except near declivity; slightly smaller and more slender; Washington and Oregon, *Chamaecyparis nootkatensis*----- *nitidus* Swaine (p. 440)
- Elytra with discal striae and lateral outlines nearly straight, not impressed across dorsum, moderately rugose-granulate; larger and slightly stouter; California, in *Cupressus* and *Sequoia*----- *cupressi* Hopkins (p. 441)
28. Male less than twice as long as wide; frons with distinct, elevated carina; elytral interspaces densely and finely granulate-punctate, with small, moderately sparse hairs on disk; declivity closely, deeply, finely punctured in both sexes----- 29
- Male 2.09 or more times as long as wide; frons with indistinct, scarcely elevated carina; elytral interspaces rugose and sparsely granulate-punctate, with minute, sparse hairs on disk; declivity with obsolete or obsolescent punctures in male----- 30
29. Elytral interspaces finely and densely granulate-punctate in male; declivity with first stria strongly impressed, first inter-

space moderately convex and subequal to second; declivital vestiture moderately abundant in male, dense in female.

cristatus (LeConte) (p. 443)

Elytral interspaces strongly rugose, moderately granulate-punctate in male; declivity with first striae weakly impressed, first interspace scarcely convex and narrower than second in both sexes; declivital vestiture rather sparse in male, moderately abundant in female.---- *chiricahua*, new species (p. 444)

30. Appearing glabrous but with sparse, minute hairs on head, pronotum, and elytral disk; declivity of female with only a few obsolescent punctures and with only a few short, very fine hairs; California, in *Sequoia sempervirens* and *Cupressus*.

sequoiae Hopkins (p. 446)

Vestiture more abundant but still rather sparse, short and fine but not minute; declivity of female finely, closely, distinctly punctured and with many scalelike hairs; Washington in *Thuja plicata* and *Libocedrus decurrens*— *squamosus*, new species (p. 448)

31. Elytral declivity of female with second interspace serrate throughout (except in some specimens of *juniperi*); male with one or two small tubercles near apex of second interspace.----- 32

Elytral declivity with second interspace entirely devoid of serrations or tubercles in both sexes.----- 38

32. Pronotum with moderately small, close punctures; elytral declivity of male with small or moderately small, not compressed serrations on first and third interspaces, those of third only slightly smaller and more numerous.----- 33

Pronotum with deep, close, moderately large punctures; elytral declivity of male with large, or very large, black, compressed, recurved serrations on first interspace, those on third more numerous and smaller.----- 35

33. Elytral declivity of male with first and third interspaces each with numerous stout, blunt serrations; female declivity with serrations of second interspace notably smaller and less numerous than those of first and third; Southeastern States, in *Taxodium distichum*----- *taxodii* Blackman (p. 450)

Elytral declivity of male with first and third interspaces with less numerous, sharp-pointed serrations; serrations on second interspace of female only slightly smaller than on first and third.----- 34

34. Length 2.25 to 2.8 mm.; elytral declivity of male with serrations on first and third interspaces smaller, rather numerous; most of declivital vestiture hairlike; Southeastern States.

dentatus (Say) (p. 452)

Length 2.86 to 3.22 mm.; elytral declivity of male with serrations on first and third interspaces larger, sparse; most of declivital vestiture scalelike; south-central Mexico.

deleoni, new species (p. 454)

35. Larger (more than 3.0 mm. long); elytral striae deep, of moderate width, declivity of male with rather sparse vestiture.----- 36

Smaller (usually less than 3.0 mm. long); elytral striae rather narrow; declivity of male with abundant vestiture.----- 37

36. Frons of male strongly granulate-punctate, not rugose; disk of pronotum deeply, moderately closely punctured; discal

vestiture of elytra moderately abundant, short, decumbent; first declivital interspace of male with large serrations moderately closely placed; California, Oregon, and Washington, in *Juniperus*----- *juniperi* Swaine (p. 455)

Frons of male closely, sublongitudinally granulate-rugose; disk of pronotum deeply, very closely punctured; discal vestiture of elytra rather sparse, short, suberect; first declivital interspace of male with large, closely set serrations; habitat and host not certainly known, known only through unique type.

serratus (LeConte) (p. 456)

37. Discal elytral interspaces of male nearly flat, with asperities on posterior half sparse and poorly developed; first interspace of declivity of male with serrations rather sparse; female with serrations of second interspace smaller and sparser than on third; Utah, Arizona, New Mexico, in *Juniperus* spp.

utahensis Swaine (p. 458)

Discal elytral interspaces of male convex, with asperities uniseriate and larger on posterior half; first interspace of male declivity with serrations moderately close, sparser near apex; female with serrations of second interspace but little smaller and sparser than on third; Arizona, New Mexico, Texas, in *Juniperus pachyphloea*, *J. mexicana*, and *Cupressus* sp.

aciculatus Bruck (p. 459)

38. Frons of male transversely impressed, sometimes deep in median area but not truly concave; pronotum with median line not more finely and closely punctured; elytral striae narrow or very narrow, with small, usually indistinct punctures----- 39

Frons of male distinctly concave; pronotum with median line more finely, closely punctured; elytral striae moderately narrow, moderately finely, distinctly punctured----- 43

39. Average size larger (ranging from 2.15 to 3.75 mm. long); pronotum with median line strongly elevated, impunctate, vestiture notably longer at sides----- 40

Average size smaller (ranging from 2.0 to 2.85 mm. long); pronotum with median line rather weakly elevated, vestiture not conspicuously longer at sides----- 41

40. Large (3.0 to 3.75 mm. long, but seldom less than 3.25 mm. long); pronotal punctures rather dense; serrations on first interspace of male equally sparse throughout; New Mexico, Colorado, Utah, in *Juniperus* spp----- *neomexicanus*, new species (p. 460)

Smaller (2.15 to 3.14 mm. long, but seldom more than 3.0 mm. long); pronotal punctures rather fine, not so dense; serrations of first interspace of male much sparser on apical half; Texas, in *Juniperus mexicana*----- *texanus*, new species (p. 462)

41. Antennal club with first two sutures subtransverse; vestiture of elytral declivity only moderately abundant, hair-like in both sexes; Northeastern States and eastern Canada.

canadensis Swaine (p. 463)

Antennal club with all three sutures distinctly oblique; vestiture of elytral declivity, in female at least, very abundant, mostly scalelike----- 42

42. Pronotum with median line distinctly elevated and impunctate on posterior two-thirds, lateral calli large, impunctate; de-

- clivital vestiture of male hairlike, that of female mostly scale-like; western Canada and northwestern Washington, in *Juniperus scopulorum*----- scopulorum Swaine (p. 465)
- Pronotum with median line weakly elevated and punctured throughout, lateral calli lacking or nearly so; declivital vestiture very abundant, mostly scalelike in both sexes; Mexico, in *Cupressus*----- tachubayae Hopkins (p. 466)
43. Frons of male opaque or subopaque, with shallow concavity subopaque; striae of elytral disk rather narrow, with small, indistinct punctures; first and second interspaces in male widened near base; California, in *Juniperus occidentalis*.
----- rugosus Swaine (p. 467)
- Frons of male shining, with deep concavity brightly polished; striae of elytral disk of moderate width, strongly impressed, with distinct punctures; first interspace of male not widened, second widened near base----- 44
44. Frons in both sexes with a small callus at each side near epistomal margin, more distinct in female, median carina short; discal interspaces of male confusedly granulate except near declivity; male declivity with large, recurved serrations on first and third interspaces; Arizona, New Mexico, Colorado, and Wyoming in *Juniperus pachyphloea*, *J. utahensis*, and *J. monosperma*----- furnissi, new species (p. 469)
- Frons devoid of calli in both sexes, median carina long in female, often indistinct in male; discal interspaces of male confusedly granulate only near base; male declivity with small serrations on first and third interspaces; California and Oregon, in *Juniperus occidentalis*--- chamberlini, new species (p. 470)

PHLOEOSINUS PINI Swaine

Phloeosinus pini SWAINE, Can. Ent., vol. 47, p. 362, 1915; Canada Dept. Agr., Ent., Branch, Bull. 14, pt. 2, pp. 67, 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 175, 1939.

Male.—Piceous-brown to black, with elytra reddish brown to piceous-brown; 2.1–2.5 mm. long, about ³ 1.92 times as long as wide.

Frons moderately wide between eyes, frontal rectangle about equal in length and width; epistomal lobe longer than usual for genus, with free end emarginate; surface black, subopaque, densely granulate-punctate; central area with a moderately deep, subcircular concavity slightly less than half as wide as distance between eyes, with a fine, rather weakly elevated, often distinct, median carina on its lower half; hairs fine and moderately short, inconspicuous. Eye about three times as long as wide, more than half divided by an emargination. Antenna with club about 1.7 times as long as wide, first two sutures slightly oblique, partly septate; third rather strongly oblique.

³ The use of the limiting term "about" in this and all other descriptions does not indicate that the measurements were guessed at or carelessly taken. The measurements and computations were very carefully made and, it is believed, apply with exactness to the specimens measured. However, there is a small amount of individual variation, and for that reason the limiting term "about" was inserted.

Pronotum about 1.22 times as wide as long, widest near middle; posterior angles rounded; sides nearly straight and feebly divergent on posterior third, strongly, arcuately narrowed on middle third, constricted just behind broadly rounded anterior margin; surface piceous to black, rather feebly shining, impressed across dorsum back of anterior margin, finely, closely punctured and finely granulate on disk and sides; median line elevated on posterior half but punctured as on rest of disk; with a small callus at each side; vestiture of fine, moderately short hairs, distinctly coarser and longer at sides.

Elytra wider than pronotum, about 1.3 times as long as wide; sides nearly straight and subparallel, moderately rounded behind; surface rather feebly shining; striae rather narrow, strongly impressed, with stria punctures small and rather inconspicuous; interspaces very wide, second widened at base, all moderately convex, densely granulate-punctate, with rather numerous larger asperities, usually confusedly arranged, but showing some tendency to a uniseriate arrangement near declivity; vestiture rather abundant, of short, slender hairs, becoming stouter posteriorly on disk and sides. Declivity with all interspaces convex and rather sparsely subequally asperate, first and third interspaces slightly more convex than second, but with asperities about equal in number and size on all; vestiture consisting of a few fine, erect hairs arising from bases of asperities, and of more numerous stouter and shorter hairs, many of them scalelike, from surface of interspaces. Mesosternum precipitous and protuberant in front between coxae.

Female.—Similar to male in habitus, but wider between eyes, frontal rectangle about 0.9 as long as wide, densely coarsely granulate-punctate, median carina faint, often lacking except for a small epistomal tubercle; elytral declivity similar to that of male, but with more numerous scalelike hairs.

Type locality.—Riding Mountains, Manitoba, Canada.

Host.—*Pinus banksiana* Lambert.

Location of type.—Canadian National Collection.

I have studied a series of 15 specimens collected and reared from the top of a small white pine by W. F. Fiske, on Grand Island, Mich., and recorded under Hopkins, U. S. Nos. 3775 and 3775a.

PHLOEOSINUS PICEAE Swaine

Phloeosinus piceae SWAINE, Can. Ent., vol. 66, p. 206, 1934.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 179, 1939.

"Length 2.2 mm.; width 1.3 mm. Black with short erect reddish pubescence, antennae and tarsi reddish; closely allied to *pini* Sw.

"Head: In the female the front is subplanate with a feeble arcuate transverse impression, closely rather coarsely granulate, punctation indistinct, pubescence very fine, with a very fine median carina on

epistomal margin and a small, indistinct, post-marginal callosity on each side, the median epistomal process small, but semicircular and emarginate; (in *male* the front is coarsely granulate-punctate, with a large, deep, subcordate impression occupying more than half the space between the eyes, and a strong median carina extending from the depth of the impression to the epistomal margin; the median epistomal process minute, lunar and entire); the antennal club elongate-oval, the 'sutures' bisinuate, subtransverse on the outer half, strongly recurved toward the base on the inner third.

"Pronotum: In the female slightly longer than wide, 2.5:2, rather strongly constricted in front on the sides, the constriction continued across the dorsum as a strong postmarginal impression, the punctation close, moderate, and subgranular, coarser than *pini*, with a smooth median line very narrow and incomplete; (in *male* decidedly wider than long, 2.2:1.5, strongly constricted in front, with the median line more distinct).

"The *elytra* are stout, longer than wide, 4:3; scutellum depressed, striae narrow and impressed, strial punctures narrow, elongate and deep; interspaces moderately convex, with coarse and fine granules, the coarser nearly uniseriate on the disc, uniseriate, sparser, and acute on the declivity, closer and more numerous near the base, 2nd interspace wider, elevated and densely granulate near base. The *declivity* in the *female* with interspaces convex, 2nd not perceptibly narrower or less elevated than 1st and 3rd, with a single row of acute granules; (in the *male* 1st and 3rd interspaces slightly more strongly convex, the 3rd with distinctly coarse granules).

"The venter is sparsely punctate, the mesosternum precipitous in front, elevated at the anterior angle into a short compressed process between the coxae, perpendicular in the female, narrower and less ridge-like than in *pini*.

"Described from two specimens collected by Mr. E. B. Watson from a tunnel in a white-spruce twig, on Berry Mountain Brook, Cascapedia River, Que.

"*Holotype*: ♀ Gaspe Co., Que., *Picea canadensis*, Aug. 2, 1933 (E. B. Watson); No. 3817 in the Canadian National Collection.

"*Allotype*.—♂, same labels."

Swain's description is quoted verbatim above. I have seen no specimens.

PHLOEOSINUS ALASKANUS, new species

PLATE 38, FIGURE 1

Male.—Black, with elytra piceous, 1.8-2.43 mm. long, holotype 2.23 mm. long, about 1.83 times as long as wide; allied to *pini* Swaine and *piceae* Swaine.

Frons rather wide between eyes, frontal rectangle about 0.92 as long as wide, epistomal lobe longer than usual for the genus, rather narrow, with free end emarginate; surface black, feebly shining to subopaque, finely and densely granulate-punctate at sides and above, central area with a deep, subcircular to cordate concavity involving about half of diameter between eyes, with a fine, elevated median carina on lower half, sometimes extending entire length of concavity; hairs fine and rather short. Eye slightly more than three times as long as wide, more than half divided by a moderately broad emargination. Antenna with club about 1.8 times as long as wide, first two sutures feebly oblique, partly septate; third suture strongly oblique, not septate.

Pronotum about 1.2 times as wide as long, widest near base; sides straight and subparallel on posterior third, strongly, arcuately narrowed, then strongly constricted just behind the broadly rounded anterior margin; surface piceous black, shining, transversely impressed across dorsum opposite anterior constriction; disk with very deep, rather close, moderate-sized punctures, much finer, closer, and subgranulate in front, punctures somewhat roughened and subgranulate on sides; median line scarcely elevated, indefinitely impressed at each side of middle on posterior third; lateral calli small or lacking; vestiture of fine, rather short hairs, definitely longer on sides.

Elytra wider than pronotum, about 1.3 times as long as wide; widest behind middle; sides feebly sinuate on anterior two-thirds, moderately broadly rounded behind; surface rather weakly shining; striae rather narrow, strongly impressed, punctures small and inconspicuous; interspaces wide, convex, second and fourth wider than others, densely granulate-punctate, granules fine and confused, asperities less numerous, confused anteriorly but becoming uniseriate posteriorly on disk and sides; vestiture of short, moderately stout hairs. Declivity (pl. 38, fig. 1) with all interspaces convex and sparsely, finely asperate, first and third interspaces slightly more strongly convex and slightly wider than second, with asperities fewer in number and slightly smaller on second; each interspace with a sparse row of rather fine, erect setae arising from asperities, and more abundant, short, broad, scalelike hairs. Mesosternum precipitous in front, protuberant between coxae.

Female.—Similar to male in habitus; wider between eyes, frontal rectangle about 0.8 as long as wide; densely, coarsely granulate-punctate, median carina almost lacking, usually represented only by a small epistomal tubercle; pronotum slightly shorter than in male, about 1.3 times as wide as long, not so strongly constricted in front; elytra with declivity very similar to that of male but with wider and more numerous scalelike hairs.

Type locality.—Eagle, Alaska.

Host.—*Picea canadensis* (Mill.) B. S. P.

Type material.—Holotype, allotype, and 14 paratypes, U.S.N.M. No. 55396.

The holotype, allotype, and 14 paratypes bear the labels "Hopk. U. S. 1170c; Eagle, Alaska; *Picea canadensis*; W. N. Osgood, Colr."

PHLOEOSINUS HOPPINGI Swaine

Phloeosinus hoppingi SWAINE, Can. Ent., vol. 47, p. 364, 1915; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 67, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 175, 1939.

Male.—Black, with elytra piceous brown, their declivity reddish brown; 1.68 to 2.15 mm. long, about 2.08 times as long as wide.

Frons wide between eyes, frontal rectangle about 0.77 as long as wide, epistomal lobe very short, surface black, moderately shining, finely, densely granulate-punctate at sides, roughly punctured, subgranulate above; deeply, not broadly concave, with concavity shining, impunctate at center, finely punctured on periphery, with a fine, distinctly elevated median carina on lower half; vestiture of fine, short hairs, inconspicuous except in profile. Eye less than three times as long as wide, less than half divided by a wide emargination. Antenna with club less than twice as long as wide, first and second sutures subtransverse, third suture oblique.

Pronotum about 1.18 times as wide as long; sides strongly arcuate on posterior two-thirds, constricted just behind very broadly rounded front margin; surface black, shining, transversely impressed across anterior dorsum; disk with very deep, rather close, moderate-sized punctures which are much smaller and denser near anterior margin, punctures close, rough, subgranulate at sides; median line weakly elevated on posterior third, lateral calli very small or lacking; vestiture of moderately short, moderately abundant hairs, only slightly longer at sides.

Elytra wider than pronotum, about 1.32 times as long as wide; sides subparallel on anterior two-thirds, very broadly rounded behind; surface shining; striae deep, moderately wide on disk and sides, punctures distinct, moderately small; interspaces wider than striae, convex, confusedly, rather closely granulate-punctate on anterior portion of disk and sides, granules becoming uniseriate posteriorly; vestiture of moderately short, fine, distinct hairs, more abundant on posterior half of disk and sides. Declivity with first and third interspaces strongly convex, with rather close, coarse, acute serrations, mesal half of first interspace very finely and densely punctured, third interspace finely punctured; second interspace narrower than first, slightly narrower than third, nearly flat, shining, finely, moderately closely punctured, devoid of serrations; fifth, seventh, and ninth

interspaces each with a few smaller serrations and fine punctures; vestiture more abundant than on disk, consisting of a few slender setae from bases of serrations and much more numerous flattened scalelike hairs. Mesosternum with anterior face steep.

Female.—Similar to male in habitus; frons wider between eyes than in male, frontal rectangle about 0.71 as long as wide, convex, finely, densely punctate-granulate, arcuately impressed, with a fine, distinct median carina; elytral declivity similar to that of male, but with serrations smaller and scales much more abundant.

This species was described by Swaine from specimens taken from "cedar limbs" in California by R. Hopping.

The specimens that I studied came from various localities in California, as follows: General Grant National Park, Sequoia National Park, Yosemite National Park, Giant Forest, Wawona, Bass Lake, Milford, Millwood, Pinecrest, Fallen Leaf Lake, Ellis Meadow, Miami, Mount St. Helena, and Monterey. The hosts cited include *Libocedrus decurrens* Torr., *Juniperus occidentalis* Hook., and *Cupressus macrocarpa* Gordon.

PHLOEOSINUS HOFERI, new species

PLATE 38, FIGURE 2

Male.—Black, with elytra piceous to reddish brown; 1.75-2.35 mm. long, holotype 2.10 mm. long, about 2.13 times as long as wide; closely allied to *hoppingi* Swaine.

Frons wide between eyes, frontal rectangle about 0.79 as long as wide, epistomal lobe rather short; surface piceous black, moderately shining, finely, closely granulate-punctate at sides, punctured and subgranulate above; deeply and broadly concave, concavity extending from level of top of eye to epistomal margin, finely punctured except at center, median carina lacking except for a small carinal tooth on epistomal margin; vestiture consisting of short, slender hairs. Eye three times as long as wide, about half divided by a moderately wide U-shaped emargination. Antenna with club about 1.8 times as long as wide, first two sutures feebly oblique, third suture more strongly oblique.

Pronotum about 1.20 times as wide as long, widest through posterior third; sides strongly arcuate on posterior two-thirds, constricted just behind broadly rounded front margin; surface shining, black with anterior margin piceous, transversely impressed across dorsum in anterior fourth; disk with very deep, rather close, moderately large punctures (slightly larger and closer than in *hoppingi*), interstices not granulate, closer and slightly finer near anterior margin, sides with punctures larger, close, subgranulate; median line feebly elevated on posterior fourth only; lateral calli

lacking; vestiture of rather short, fine hairs, not notably longer on sides.

Elytra wider than pronotum, about 1.33 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, very broadly rounded behind; surface shining; striae deep, moderately wide (slightly wider than in *hoppingi*) on disk and sides; punctures moderately large, rather close (larger and closer than in *hoppingi*); interspaces convex, from one and a half to nearly two times as wide as striae, rather finely and closely, confusedly granulate-punctate on anterior part of disk and sides, becoming uniseriately asperate on first and alternate segments behind; vestiture of moderately short, slender hairs, more abundant on posterior disk and sides. Declivity (pl. 38, fig. 2) with first and third interspaces strongly convex, with coarse, dark, recurved serrations, punctures very fine and moderately close (finer and sparser than in *hoppingi*); second interspace nearly flat, narrower than third and narrowed toward apex, brilliantly shining, with fine obsolescent punctures, devoid of serrations; fifth, seventh, and ninth interspaces each with a few small serrations; vestiture nearly entirely hairlike with a few scalelike hairs on second interspace and elsewhere. Anterior face of mesosternum moderately steep.

Female.—Similar in general proportions to male, frons wider between eyes, frontal rectangle about 0.72 as long as wide, punctured above, feebly punctate-granulate at sides, transversely impressed, with a definite, elevated median carina on lower half; elytral declivity similar in general to that of male, but with much finer serrations, deeper and more numerous punctures on first three interspaces, and more abundant scalelike vestiture on declivital face.

Type locality.—Ute Pass, Colo.

Additional localities.—Fort Garland and Roosevelt National Forest, Colo.; Vermejo, Meek, Capitan Mountains, Las Vegas, and Capulin, N. Mex.; Davis Mountains, Tex.; Yellowstone National Park, Wyo.; Panguitch, Kamas, and Bryce National Park, Utah; Prescott National Forest, Ariz.

Host.—*Juniperus scopulorum* Sargent.

Additional hosts.—*Juniperus pachyphloea* Torrey, *J. utahensis* (Engelm.) Lemmon.

Type material.—Holotype, allotype, and 233 paratypes, U.S.N.M. No. 55397.

Remarks.—The holotype, allotype, and 5 paratypes were taken from *Juniperus scopulorum* at Ute Pass, Colo., by G. Hofer; 22 paratypes were collected from Capitan Mountains, N. Mex., by J. I. Webb; 14 paratypes were taken from *Juniperus*, Vermejo, N. Mex., by A. D. Hopkins; 69 paratypes from *J. utahensis* at Las Vegas,

N. Mex., by Barber and Schwarz; 1 paratype was taken from *J. pachyphloea* at Meek, N. Mex., by W. F. Fiske; 1 paratype was taken at Buena Vista, Colo., by H. F. Wickham; 58 paratypes from juniper at Fort Garland, Colo., by A. D. Hopkins; 15 paratypes from *J. pachyphloea* in Roosevelt National Forest by M. W. Blackman; 4 paratypes from *J. pachyphloea* at Davis Mountain, Tex., by W. F. Fiske; 11 paratypes from *J. pachyphloea* in Panguitch and Kamas, Utah, by H. E. Burke; and 33 paratypes from *J. pachyphloea* at Prescott, Ariz., by M. W. Blackman. In addition numerous specimens from several localities in Utah, Wyoming, Colorado, New Mexico, and Arizona have recently been taken by R. L. Furness.

PHLOEOSINUS KEENI, new species

Male.—Piceous to black, with posterior elytra reddish to piceous brown; 2.15 to 2.8 mm. long, holotype 2.57 mm., about 2.04 times as long as wide.

Frons wide between eyes, frontal rectangle about 0.70 as long as wide; epistomal margin slightly thickened, epistomal lobe moderately short; central area broadly, deeply concave, finely, closely granulate-punctate at sides and above, concavity shining and impunctate in median fourth, finely granulate-punctate on the slopes at sides and above, with a rather indistinct, not sharply elevated median carina in lower half of concavity; hairs moderately short, cinereous, inconspicuous except in profile. Eye about 2.7 times as long as wide, more than half divided by a broad V-shaped emargination. Antenna with club slightly less than twice as long as wide, first two sutures slightly but distinctly oblique, third suture strongly, sinuately oblique.

Pronotum about 1.14 times as wide as long, widest just behind middle, sides feebly diverging to the widest point, then strongly, arcuately narrowed, constricted just back of the broadly rounded anterior margin; surface shining, transversely impressed behind front margin; disk with close, deep, moderately fine punctures, slightly rougher at sides; elevated median line lacking; lateral calli rather poorly developed, sometimes lacking; pubescence short and fine, inconspicuous except when seen in profile.

Elytra wider than pronotum, nearly 1.30 times as long as wide, slightly wider at about middle; sides subparallel on anterior two-thirds, broadly rounded behind; surface moderately shining on disk; striae narrow, impressed on disk, wider behind and on sides, stria punctures small, rather close; interspaces several times as wide as striae, moderately finely, closely punctate-granulate, the granules confused on disk, with a uniseriate row of larger asperities on first, third, and alternating interspaces, starting near summit of declivity;

hairs small, short, and rather scanty on anterior disk, becoming longer, stouter, and more plentiful posteriorly. Declivity with interspaces closely punctured, clothed for the most part with short, flattened, scalelike, recumbent hairs, with a few semierect setae; first and third interspaces strongly convex, serrations of moderate size; somewhat coarser and sparser on first than on third; fifth and seventh interspaces each with two or three smaller serrations; second interspace narrower than on disk, narrower than first or third, nearly flat, devoid of serrations, with numerous stout, scalelike hairs. Anterior face of mesosternum very steep.

Female.—Similar to male in general habitus; frons wider between eyes, frontal rectangle about 0.67 as long as wide, densely granulate-punctate, with a rather low carina extending from epistomal margin to arcuate transverse impression; elytral declivity with first and third interspaces strongly convex, each with a row of small serrations, smaller than in male.

Type locality.—Mount Rainier National Park, Wash.

Additional locality.—Fairfax, Wash.

Host.—*Chamaecyparis nootkatensis* (Lambert) Sudw.

Type material.—Holotype, allotype, and 76 paratypes, U.S.N.M. No. 55398.

Remarks.—The holotype, allotype, and 60 paratypes were reared from small branches of *Chamaecyparis nootkatensis* taken in Mount Rainier National Park by F. P. Keen and W. J. Buckhorn; 16 paratypes were taken from *C. nootkatensis* at Fairfax, Wash., by J. A. Beal.

PHLOEOSINUS ANTENNATUS Swaine

Phloeosinus antennatus SWAINE, Can. Ent., vol. 56, p. 146, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 177, 1939.

Male.—Black, with elytra reddish brown to piceous; 1.6 to 2.0 mm. long, about 2.0 times as long as wide.

Frons black, shining, broad between eyes, frontal rectangle about 0.77 as long as wide, epistomal lobe rather short; finely granulate-punctate at sides and above, central area moderately deeply concave (concavity about as narrow but deeper than in *hoppingi*), occupying only about half of space between eyes, with a strong, sharply elevated median carina on lower three-fifths of concavity; vestiture fine, short, and inconspicuous. Eye about three times as long as wide, more than half divided by a deep, moderately wide emargination. Antenna with club twice as long as wide, first suture nearly transverse, second suture slightly oblique, third suture strongly oblique.

Pronotum about 1.17 times as wide as long, widest near middle; sides nearly straight and feebly diverging on posterior half, then

strongly, arcuately narrowed, strongly constricted just behind broadly rounded anterior margin; surface black, shining, transversely impressed just behind front margin, with deep, close, moderate-sized punctures on disk, finer and closer in front, very closely, roughly punctured at sides; median line feebly elevated on posterior third only, lateral calli lacking; vestiture of short, fine, moderately abundant hairs.

Elytra slightly wider than pronotum, about 1.37 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, rather broadly rounded behind; surface shining, striae deep, of moderate width, with moderately large punctures; interspaces slightly wider than striae on disk and sides, convex, finely and closely granulate-punctate, becoming coarser and uniseriate only near declivity; vestiture of short, moderately fine hairs. Declivity with first, third, and alternate interspaces convex, finely, closely punctured, each with a uniseriate row of small, blunt, rather sparse serrations; second interspace nearly flat, narrower than first and third interspaces, finely punctured, entirely devoid of serrations, slightly narrowed toward apex; vestiture consisting of a few slender hairs from bases of serrations and numerous spatulate and scalelike hairs over the entire declivity. Anterior face of mesosternum steep.

Female.—Similar to male in size and proportions, with frons wider between eyes, frontal rectangle about 0.73 as long as wide, finely, densely granulate-punctate throughout, transversely impressed, median carina distinct, acutely elevated, pronotum not so strongly constricted anteriorly, elytral declivity similar to that of male, with serrations only slightly smaller and vestiture slightly more abundant.

Type locality.—Strawberry, Calif.

Host.—*Libocedrus decurrens* Torr.

Location of type.—Canadian National Collection No. 731.

Remarks.—The foregoing descriptions were prepared from 4 paratypes lent by W. J. Chamberlin and 25 specimens bearing identical data and all collected by Chamberlin, August 5, 1919. Additional specimens are from Hackamore and Siskiyou County, Calif., and Pinehurst, Wapinitia, Phoenix, and Wonder, Oreg. All are from *Libocedrus decurrens*.

PHLOEOSINUS CORONATUS Chapuis

Phloeosinus coronatus CHAPUIS, Synopsis des Scolytides, p. 39, 1869; Extr. Mem. Soc. Roy. Sci. Liège, p. 247, 1873.—BLANDFORD, Biol. Centr.-Amer., Coleop., vol. 4, pt. 6, p. 160, 1897.

“Ovatus, subopacus, pallide brunneus; capite nigro, subtiliter punctato, late depresso, depressione pilis flavis, subfasciculatis circumdata; prothorace longitudine plus duplo latiori, summo apice

fortiter constricto, subtiliter punctato, pube lutea oblecto; elytris subtiliter punctato-striatis, interstitiis punctulatis, pilus luteis, squamiformis ornatis, 3° versus apicem subampliato.—Long. $1\frac{3}{4}$ mill. Yucatan."

The writer has not seen a specimen of this species, but from the rather general description he believes that it is a male and is fairly closely related to *antennatus*, as shown by the frontal characters and by the declivity ornamented with scalelike hairs, and by inconspicuous serrations (not mentioned in description).

PHLOEOSINUS SPINOSUS, new species

PLATE 38, FIGURES 5, 6

Male.—Black, with posterior part of elytra reddish brown; 1.94 mm. long, about 2.09 times as long as wide.

Frons black, shining, broad between eyes, frontal rectangle about 0.74 as long as wide; epistomal lobe rather short; central portion deeply, rather broadly concave, surface brightly shining and impunctate in median area, finely punctate at each side, median carina reduced to a small tooth just above epistomal margin; sides of frons finely, closely granulate-punctate, not so closely punctured and without granules in median area above; pubescence semierect, short, inconspicuous except in profile. Eye elongate, nearly half divided by a broad emargination on inner margin. Antenna with club about 1.85 times as long as wide, first suture slightly oblique, second more strongly oblique and sinuate, third very strongly oblique.

Pronotum about 1.20 times as wide as long, sides strongly and nearly regularly arcuate on posterior two-thirds, widest slightly behind middle, strongly constricted in anterior third, broadly rounded in front; surface shining, moderately impressed just behind anterior margin; rather finely, deeply, rather closely punctured, interstices not granulate on disk, very slightly roughened at sides; median line not elevated; vestiture short and fine, visible but not conspicuous.

Elytra slightly wider than pronotum, about 1.26 times as long as wide; sides subparallel on anterior two-thirds, moderately rounded behind, with ends of spines extending beyond outline; surface shining, piceous brown, with posterior third reddish brown and extreme base slightly reddish; striae moderately impressed, much narrower than interspaces, punctures fine, moderately close, shallow; interspaces much wider than striae, moderately convex, granulate-punctate, uniseriately asperate on posterior two-thirds, the asperities on first and alternate interspaces becoming much higher, sharper, and spinelike posteriorly, pubescence short, fine, and inconspicuous anteriorly, stouter behind (pl. 38, fig. 5). Declivity with first and third interspaces strongly convex, with rather close, fine punctures, each

bearing a short, stout, scalelike hair, with a sparse row of large, long, sharp spines, the posterior three or four each with its base broad, occupying from one-half to two-thirds of the diameter of the interspace and from two to three times as long as wide; third interspace with about four slightly smaller but similar spines, fifth and seventh interspaces each with one or two sharp spinelike asperities; second interspace nearly flat, shining, punctured, with short, wide, scalelike hairs. Front face of mesosternum moderately steep.

Female.—Similar to male in general proportions and size; frons broader between eyes, frontal rectangle about 0.66 as long as wide; somewhat flattened below, arcuately impressed, with a distinct, elevated median carina on its lower half; pronotum indefinitely impressed behind at each side of median line; elytral declivity (pl. 38, fig. 6) with first and third interspaces only moderately convex, each with a sparse row of small, inconspicuous, rather sharp asperities; all interspaces clothed with numerous hairs, some of which are slender but most of which are short and somewhat scalelike.

Type locality.—Chiricahua Mountains, N. Mex.

Additional locality.—Pine, Ariz.

Host.—*Cupressus arizonica* Greene.

Type material.—Holotype, allotype, and six paratypes, U.S.N.M. No. 55400.

Remarks.—The holotype, allotype, and one paratype (a fragment) were collected by Donald DeLeon from *Cupressus arizonica*, Chiricahua Mountains, N. Mex., October 2, 1936; and five paratypes were collected from the same host, at Pine, Ariz., by R. L. Furniss.

PHLOEOSINUS SWAINEI Bruck

Phloeosinus minutus SWAINE (not Blandford, 1894), Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 1, p. 9, 1917.

Phloeosinus swainei BRUCK, Can. Ent., vol. 65, p. 56, 1933.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 173, 1939.

Male.—Black, with antennal club and tarsi brown; pubescence moderately abundant, reddish cinereous; 1.75 to 2.1 mm. long, about 1.91 times as long as wide.

Frons black, moderately shining; broad between eyes, frontal rectangle about 0.68 as long as wide; epistomal margin slightly thickened, epistomal lobe short and inconspicuous; broadly, moderately deeply concave, finely punctate and distinctly granulate at sides and above, concavity smooth and brightly shining above in middle fourth, with a fine, moderately elevated, rather short median carina on ventral two-fifths of concavity; vestiture fine and short at sides and above, longer on epistoma. Eye elongate, about 2.8 times as long

as wide, more than half divided by a deep, rather wide emargination. Antenna with club more than twice as long as wide, first and second sutures partially septate, slightly oblique, third suture strongly oblique.

Pronotum about 1.22 times as wide as long, sides feebly arcuate on posterior two-fifths, then strongly, arcuately narrowed, strongly constricted just behind the very broadly rounded anterior margin; surface rather weakly shining, transversely impressed just behind anterior margin; disk with close, deep punctures of moderate size, slightly roughened and subgranulate at sides; median line weakly elevated behind but punctured throughout; vestiture short and fine, less conspicuous than in *hoppingi*, more so than in *antennatus*.

Elytra slightly wider than pronotum, about 1.25 times as long as wide, widest at base; sides nearly straight and subparallel on anterior two-thirds, very broadly rounded behind; surface shining; striae deep, rather narrow on disk, wider on sides, punctures small, rather close; interspaces several times as wide as striae, convex, finely and closely granulate, each with a slightly irregular, uniseriate row of coarser granules or asperities; pubescence consisting of short, fine, moderately abundant, reddish-yellow hairs. Declivity with striae punctures somewhat coarser and rougher; first and third interspaces rather weakly convex, with a few irregularly arranged, rather sharp serrations; second interspace flat, narrowed toward apex, finely, sparsely punctate; vestiture short and fine, reddish yellow, more conspicuous than on disk, entirely hairlike.

Female.—Similar to male in general habitus; frontal rectangle about 0.64 as long as wide; frons wider between eyes than in male, somewhat flattened, impressed between the eyes, finely granulate-punctate, with a fine, elevated median carina on lower half; sides of pronotum not so strongly constricted near anterior margin; elytral declivity with smaller, sharp, irregularly arranged serrations.

Type locality.—Fairfax, Cypress Ridge, Marin County, Calif.

Host.—Not recorded.

Location of type.—Canadian National Collection, Ottawa, Canada.

Remarks.—I have studied one specimen from the type locality; two from Mount Saint Helena, Calif., taken from *Cupressus sargentii* Jepson by Donald DeLeon; and three specimens from Mount Tamalpais, Calif., taken from *C. sargentii* by F. P. Keen.

The species was originally described by Swaine under the name of *Phloeosinus minutus*. Bruck, finding this name preoccupied, renamed it *swainei* in honor of the original describer.

PHLOEOSINUS GRANULATUS Bruck

Phloeosinus granulatus BRUCK, Southern California Acad. Sci. Bull. 35, p. 33, 1936.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 173, 1939.

Male.—Black, with elytra reddish brown; 1.5 to 2.0 mm. long, about 1.86 times as long as wide; allied to *swainei*.

Frons black, moderately shining; broad between eyes, frontal rectangle about 0.71 as long as wide, epistomal lobe short; broadly, deeply concave (deeper than in *swainei*), with concavity shining and glabrous, with a few obsolescent punctures; median carina strongly elevated, extending from epistomal margin to depth of concavity; sides finely, densely granulate-punctate, median area above concavity roughly punctured; vestiture of fine, rather short hair, inconspicuous except in profile, longer on epistoma. Eye more than three times as long as wide, more than half divided by a very wide U-shaped emargination. Antenna with club less than twice as long as wide, first and second sutures nearly transverse, third suture strongly oblique.

Pronotum about 1.25 times as wide as long; sides nearly straight and feebly converging on posterior three-fifths, then strongly arcuately narrowed to lateral constriction just posterior to broadly rounded front margin; surface black, moderately shining, rather strongly, transversely impressed behind anterior margin; disk very deeply, moderately finely, rather roughly punctured, not granulate but with narrow interstices very finely reticulate; punctures finer and closer anterior to impression, with very fine granules; sides with punctures closer than on disk, granulate; median line slightly elevated on posterior third; lateral calli nearly lacking; vestiture of short and fine hairs on entire disk, slightly longer in front and moderately longer on sides.

Elytra wider than pronotum, about 1.22 times as long as wide; sides subparallel on anterior two-thirds, very broadly rounded behind; surface moderately shining; striae moderately strongly impressed, moderately narrow on disk, wider on sides, punctures small, rather close, larger on sides; interspaces wide, convex, distinctly punctate, scarcely granulate, with a sparse, uniseriate row of small sharp asperities on all interspaces, becoming larger posteriorly on first, third, and alternate interspaces on both disk and sides; vestiture consisting of moderately numerous short, fine hairs. Declivity with striae punctures about as on disk, first and third interspaces strongly convex, finely punctured, each with a row of sparse, moderately small, sharp, dark-colored serrations; fifth, seventh, and ninth interspaces finely punctured, each with a few small, sharp asperities; second interspace flat, slightly narrower than on disk; vestiture consisting of short, fine hairs and more numerous, flat, scalelike hairs. Anterior face of mesosternum precipitous.

Female.—Similar to male in habitus, frons wider between eyes, frontal rectangle about 0.61 as long as wide, with a strong, arcuate, transverse impression and a rather short, fine, elevated median carina;

pronotum regularly, arcuately narrowed from base to lateral constriction; elytral declivity similar to that of male but with notably smaller serrations and more abundant scalelike vestiture.

This species is closely related to *swainei*. It is similar in size, proportions, and general habitus. It can, however, be readily separated by differences in the frontal concavity and frontal carina, the shape and sculpture of the pronotum, the width of the elytral striae, the sculpture of the discal interspaces, and the declivital characters. Perhaps the most readily grasped difference is in the declivital vestiture, which in *swainei* is entirely hairlike while in *granulatus* it is largely scalelike in both sexes.

Type locality.—Santa Ana Canyon, Orange County, Calif.

Host.—*Cupressus forbesii* Jepson.

Location of types.—Private collection of C. R. Bruck.

Remarks.—The foregoing description was prepared from a male and a female paratype kindly loaned by J. N. Knull. I have seen no other specimens of this species.

PHLOEOSINUS FRONTALIS Bruck

PLATE 38, FIGURES 3, 3a

Phloeosinus frontalis BRUCK, Can. Ent., vol. 65, p. 55, 1933.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 173, 1939.

Male.—Black, with elytra reddish brown to piceous; holotype 2.08 mm. long, about 1.82 times as long as wide.

Frons piceous black, brightly shining, moderately broad between eyes, frontal rectangle about 0.8 as long as wide, epistomal lobe short; deeply, very broadly concave, with concavity extending from above eyes to epistomal margin, polished and impunctate in median area, finely, closely granulate-punctate at sides, punctured and subgranulate above; median carina on lower half, ending in a small tubercle at epistomal margin; vestiture of fine hairs, rather longer than usual at sides and above concavity. Eye nearly three times as long as wide, more than half divided by a rather wide emargination. Antenna with club slightly less than twice as long as wide, first suture slightly, the others progressively more oblique.

Pronotum about 1.25 times as wide as long, widest through posterior angles; sides nearly straight, feebly arcuate and feebly convergent on posterior half, then much more strongly arcuate and convergent to lateral constrictions just behind very broadly rounded front margin; surface shining, transversely impressed across anterior third of dorsum; disk with deep, close, rather rough, moderate-sized punctures, finer, closer, and subgranulate near anterior margin, moderately coarse, dense, subgranulate at sides; median line not elevated;

lateral calli lacking; hairs cinereous, rather short, inconspicuous on disk, notably longer and more conspicuous on sides.

Elytra slightly wider than pronotum, about 1.19 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface shining; striae moderately narrow, deeply impressed, punctures rather small, rather deep, moderately close; interspaces much wider than striae, not uniform in width, first much wider behind, finely granulate-punctate, with larger asperities confused near base, becoming uniseriate farther back on disk and sides; vestiture of moderately abundant, short, fine hairs on anterior part, becoming stouter and more conspicuous behind. Declivity (pl. 38, figs. 3, 3a) with first and third interspaces moderately strongly convex, each with a row of rather sparse, moderately large, sharp, recurved serrations, and with numerous small, close, deep punctures; second interspace nearly flat, shining, narrowed posteriorly, with fine, rather rough punctures; fifth, seventh, and ninth interspaces each with a few small serrations and small punctures; vestiture consisting of a few slender setae from bases of serrations and many stout, flattened or scalelike hairs. Anterior face of mesosternum somewhat obliquely declivitous.

Female.—Similar to male in habitus, frons wider between eyes, frontal rectangle about 0.7 as long as wide; finely granulate-punctate at sides, punctured above, broadly transversely impressed, with a distinct elevated median carina, vestiture of moderately short, slender hairs⁴; elytral declivity similar to that of the male in general features, but with serrations notably smaller, punctures denser, and vestiture much more abundant.

Type locality.—Rialto, Calif.

Host.—*Cupressus arizonica* Greene.

Type material.—Holotype and allotype, U.S.N.M. No. 53820.

Remarks.—The foregoing descriptions were prepared from the holotype and allotype in the United States National Museum. The material was collected by H. E. Burke. Four other specimens collected by Burke at the same location and from the same host were also studied.

PHLOEOSINUS SETOSUS Bruck

Phloeosinus setosus BRUCK, Can. Ent., vol. 65, p. 54, 1933.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 172, 1939.

Male.—Black, with elytra reddish brown to piceous; 1.5–2.5 mm. long, about 1.94 times as long as wide.

⁴ Not "densely clothed with short, scale-like hairs," as described by Bruck. The apparent scalelike structures are fragments of frass adhering to the surface at bases of hairs.

Frons broad between eyes, frontal rectangle about 0.72 as long as wide, epistomal lobe short; moderately broadly, not deeply concave between eyes, with a very strongly elevated median carina on more than the lower half; surface shining, black, finely and closely punctate-granulate at sides, roughly punctured in median area above concavity, granules finer in concavity; vestiture of fine, short, inconspicuous hairs. Eye more than three times as long as wide, more than half divided by a very broad emargination. Antenna with club about 1.6 times as long as wide, first two sutures slightly oblique, third suture strongly oblique.

Pronotum about 1.20 times as wide as long, widest at posterior angles, sides nearly regularly arcuate from base to lateral constriction just behind moderately rounded front margin; surface black, moderately shining, broadly, transversely impressed in anterior third, with very deep, close, moderate-sized punctures on disk, anterior portion more closely punctured and subgranulate, sides roughly, subgranulately punctured; median line not elevated; lateral calli very small or lacking; vestiture rather short and fine, somewhat longer at sides.

Elytra wider than pronotum, about 1.24 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface brightly shining, reddish brown to nearly black; striae very deep, more than half as wide as interspaces, punctures of moderate size, rather deep, separated by more than own diameters; interspaces convex, confusedly granulate-punctate on anterior third of disk, strongly rugose and uniseriately asperate behind, asperities transverse, with one, two, or more punctures at posterior base of each, each giving rise to an erect, rather short seta, punctures and setae more numerous on sutural interspaces behind middle of disk. Declivity with first and third interspaces strongly convex, sparsely asperate, densely and finely punctured, with erect setae as on disk and with more numerous, flat, scalelike, nearly white hairs, very numerous on first interspace, forming a white stripe, less numerous on third interspace, second interspace weakly convex, with surface brightly polished and bare, devoid of serrations but with a few minute, obsolescent punctures; more lateral interspaces all finely asperate, with less numerous hairs. Anterior face of mesosternum steep.

Female.—Similar to male in size and general appearance; frons very wide between eyes, frontal rectangle about 0.66 as long as wide, coarsely, densely granulate-punctate, broadly, transversely impressed, median carina less strongly elevated than in male; elytral declivity similar to that of male but with serrations slightly smaller.

Type locality.—Mount Saint Helena, Calif.

Host.—*Cupressus sargentii* Jepson.

Location of type.—Collection of C. R. Bruck.

Remarks.—The above description was prepared from two series of specimens collected by R. L. Furniss from *Cupressus sargentii* and *Libocedrus decurrens* Torrey at the type locality, Mount Saint Helena, Calif.

PHLOEOSINUS ARIZONICUS, new species

PLATE 38, FIGURES 4, 4a

Male.—Black, with elytra reddish brown; 1.8 to 2.37 mm. long, holotype 2.17 mm. long, about 1.95 times as long as wide; closely related to *P. setosus* Bruck but slightly more slender and with the elytral striae wider.

Frons broad between eyes, frontal rectangle about 0.72 as long as wide; epistomal lobe very short; central portion widely, shallowly concave; with a fine, elevated, median carina (smaller than in *setosus*) extending upward to beyond center of concavity; surface shining, finely and closely granulate-punctate throughout, the granules finer in concavity but present everywhere except on carina; pubescence inconspicuous, fine, and short. Eye more than three times as long as wide, more than half divided by a broad emargination. Antenna with club about 1.8 times as long as wide, first two sutures slightly oblique, third suture strongly oblique.

Pronotum about 1.24 times as wide as long; sides strongly and nearly regularly arcuate on posterior three-fourths, then strongly constricted, very broadly rounded in front; surface shining, rather broadly impressed just behind anterior margin, deeply, closely, rather finely punctured on disk, somewhat roughened, subgranulate at sides; median line not elevated, but surface feebly, indefinitely impressed at each side of disk in posterior third; vestiture very short and fine, much less conspicuous than in *setosus*.

Elytra slightly wider than pronotum, about 1.26 times as long as wide; sides straight and subparallel on anterior half, then at first gently then abruptly narrowed, moderately rounded behind; surface brightly shining, reddish brown; striae nearly as wide as interspaces, rather deep, punctures moderately large, shallow, moderately spaced; interspaces narrower than in *setosus*, convex, rugose, asperate, finely punctured, asperities confused near base, somewhat irregular throughout on disk, with fine, short setae (less conspicuous than in *setosus*) becoming stouter posteriorly. Declivity (pl. 38, figs. 4, 4a) with first and third interspaces strongly convex, sparsely and finely asperate (finer than in *setosus*), densely, finely punctured, with a few erect setae and with more numerous, flattened, scalelike, nearly white

hairs, numerous on first interspace, more scalelike and less numerous on third interspace; second interspace slightly narrower than on disk, feebly convex (flatter than in *setosus*), with surface shining and devoid of punctures and pubescence. Mesosternum steep in front.

Female.—Similar to male in size and general appearance; frons very broad between eyes, frontal rectangle 0.66 as long as wide; somewhat flattened below, with a fine, strongly elevated median carina on its lower half; elytral interspaces slightly wider than in male; with pubescence slightly more conspicuous on elytra and pronotum than in male but less evident than in *setosus*.

Type locality.—Santa Catalina Mountains, Ariz.

Additional locality.—Chiricahua Mountains, Ariz.

Host.—*Cupressus arizonica* Greene.

Type material.—Holotype, allotype, and 31 paratypes, U.S.N.M. No. 55401.

Remarks.—The holotype, allotype, and 25 paratypes were collected by M. Chrisman in *Cupressus*, Santa Catalina Mountains, Ariz.; and 6 paratypes were taken from *C. arizonica* by J. L. Webb, Chiricahua Mountains, Ariz. A long series collected by R. L. Furniss from *C. arizonica* at Pine, Ariz., has recently been received.

PHLOEOSINUS VANDYKEI Swaine

Phloeosinus vandykei SWAINE, Can. Ent., vol. 47, pp. 366, 367, 1915; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 68, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 176, 1939.

Phloeosinus russus SWAINE, Can. Ent., vol. 56, p. 148, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 178, 1939. (New synonymy.)

Male.—Piceous-brown to black with elytra reddish brown and brightly shining; 1.8 to 2.25 mm. long, about twice as long as wide.

Frons moderately wide between eyes, frontal rectangle about 0.76 as long as wide, epistomal lobe rather short; surface black, shining, finely, moderately closely punctured and finely granulate at sides, more sparsely punctured and subgranulate above; central area widely, deeply concave, median portion glabrous, brightly shining, median carina reduced to a tubercle on lower margin, the concavity continued in median line, above to vertex as a shallow, moderately wide, indefinite impression, hairs at sides and above short and fine. Eye three times as long as wide, nearly half divided by the emargination. Antenna with club nearly exactly twice as long as wide, first two sutures oblique, slightly arcuate, third suture more strongly oblique and sinuate.

Pronotum about 1.2 times as wide as long, widest just behind middle; sides arcuate on posterior half, then strongly, arcuately narrowed, constricted just behind broadly rounded front margin; surface

piceous black, shining, punctures deep, somewhat sparser than usual, of moderate size; lateral calli lacking, the disk indefinitely impressed at each side of median line on posterior fourth; pubescence fine, short, and inconspicuous, only slightly longer at each side just anterior to position of lateral calli.

Elytra wider than pronotum, about 1.35 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface brightly shining, striae rather deeply impressed, much narrower than interspaces, stria punctures small, narrow, and elongate, not very close; interspaces wide, convex, surface granulate-punctate, with granules sparse, confusedly asperate near base, rounded and confused on most of disk, becoming uniseriate on alternate interspaces posteriorly, punctures rather fine, with a few very fine, short hairs. Declivity with all of interspaces slightly convex, first and third scarcely more convex than second, surface nearly smooth, with asperities nearly obsolete, those on ninth interspace slightly larger than on others, second interspace subequal to first, narrower than third. Anterior face of mesosternum moderately oblique.

Female.—Similar to male in appearance, with frons convex, closely punctate-granulate below, more sparsely punctured above, with a fine, acute median carina on lower half, with frontal rectangle about 0.70 as long as wide; elytral interspaces slightly more strongly (but still weakly) asperate on declivity than in male.

Type locality.—Fresno County, Calif.

Host.—"Cedar limbs."

Location of type.—Canadian National Collection No. 2173.

Remarks.—Numerous specimens in the United States National Museum were taken at various localities in California and southern Oregon, mostly from *Libocedrus decurrens* Torrey and in one case from *Thuja plicata* D. Don.

Phloeosinus russus was described by Swaine as of about the same size as, and closely allied to, *vandykei* Sw.; more feebly shining, with short, easily seen pubescence; with elytral interspaces more convex, and with uniseriate asperities, large on disk and smaller on declivity. The species was described from a single female specimen labeled "S. B. Mts. (San Bernardino Mountains?), Cal. 7/19/92." The description is very brief, and, if I have interpreted it correctly, it applies very closely to several specimens selected from the rather long series of *vandykei* showing coarser elytral sculpture and more evident vestiture. It is believed that *P. russus* Swaine should be placed as a synonym of *P. vandykei* Swaine.

PHLOEOSINUS FULGENS Swaine

PLATE 38, FIGURE 8

Phloeosinus fulgens SWAINE, 1924, Can. Ent., vol. 56, p. 147, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 178, 1939.

Male.—Black throughout except antenna and tarsi, brightly shining; 2.0 to 2.71 mm. long, about 2.07 times as long as wide.

Frons moderately wide between eyes, frontal rectangle about 0.72 as long as wide, epistomal lobe short; surface moderately shining, strongly granulate-punctate throughout, broadly, moderately shallowly concave, with little indication of a median carina except for a small tubercle just above epistomal margin; hairs short and fine. Eye about three times as long as wide, more than half divided by a moderately wide U-shaped emargination. Antenna with club about twice as long as wide, all sutures distinctly oblique.

Pronotum about 1.09 times as wide as long, widest on posterior third, sides nearly straight and subparallel on posterior third, then strongly, arcuately narrowed, constricted just behind moderately broadly rounded front margin; surface shining, transversely impressed just behind anterior margin; with dense, deep, moderate-sized punctures, finer and even more dense near front margin, punctate-granulate at sides; median line indistinct, lateral calli usually lacking; hairs very short and fine.

Elytra wider than pronotum, about 1.34 times as long as wide, widest across basal serrations; sides nearly straight and subparallel, broadly rounded behind; surface shining; striae on disk moderately narrow, strongly impressed, punctures of moderate size, shallow, longer than wide, distinct; striae slightly wider and punctures slightly larger on sides; interspaces wider than striae, weakly convex, very densely, confusedly, rather coarsely granulate-punctate, granules not becoming uniseriate on disk; appearing glabrous, but with minute, very inconspicuous hairs, to be seen only in profile. Declivity (pl. 38, fig. 8) brightly shining, striae deeply impressed and striae punctures distinct; first and third interspaces strongly convex, each with a few, rather small, indistinct granules, and fine, indistinct punctures; second interspace more weakly convex, as wide as others, brightly polished, devoid of serrations or granules, with a few, very fine, obsolescent punctures; hairs sparse and minute. Anterior coxae moderately widely separated, anterior face of mesosternum oblique.

Female.—Similar to male, but with frons wider and shorter, frontal rectangle about 0.69 as long as wide, convex; arcuate, transverse impression variable but usually strong, median carina sharply elevated on lower half; elytral declivity similar to that of male, the hairs slightly larger and more numerous but still short and fine.

Type locality.—Norfolk, Calif.

Host.—*Libocedrus decurrens* Torrey.

Location of type.—Canadian National Collection, Ottawa, Canada.

Remarks.—I have studied 57 specimens of *fulgens* collected at Yosemite National Park, Paradise Creek, Wawona, Sequoia National Forest, Placerville, and Eldorado County, Calif., and at Ashland and Wonder, Oreg. The host cited in each case is *Libocedrus decurrens* Torrey.

PHLOEOSINUS SPLENDENS, new species

PLATE 38, FIGURE 7

Male.—Black, with elytra reddish brown to piceous brown; brightly shining; 2.37 to 2.8 mm. long, holotype 2.51 mm. long, about 2.02 times as long as wide; closely allied to *fulgens*.

Frons moderately wide between eyes, frontal rectangle about 0.75 as long as wide, epistomal lobe very short; surface brightly shining, rather closely, deeply punctured, granulate-punctate only at sides (cf. *fulgens*), moderately broadly and deeply concave, median carina nearly obsolete; hairs short and fine. Eye not quite three times as long as wide, about half divided by a wide U-shaped emargination. Antenna with club exactly twice as long as wide, all sutures oblique.

Pronotum about 1.06 times as wide as long, widest at posterior angles; sides nearly straight (feebly arcuate) and very feebly converging on posterior half, then more strongly, arcuately narrowed, constricted just back of broadly rounded anterior margin, with dorsum transversely impressed; surface brilliantly shining, with moderately coarse, deep, closely placed punctures (coarser and less closely placed than in *fulgens*, with larger interstices which are much more brightly polished), punctures much finer and closer near anterior margin, dense and granulate at sides; median line distinct in middle third; lateral calli nearly lacking; hairs minute.

Elytra wider than pronotum, about 1.30 times as long as wide, slightly widest back of middle; sides subparallel on anterior two-thirds, broadly rounded behind; surface brightly shining, discal striae deep, of moderate width (wider than in *fulgens*), punctures rather coarse, moderately spaced, rather shallow, distinct (coarser and less shallow than in *fulgens*), striae on sides wider, nearly equal in width to sixth interspace, punctures slightly larger; interspaces on disk wider than striae, weakly convex, densely, confusedly, moderately coarsely granulate-punctate on anterior disk, granules becoming brightly polished and lower at top of declivity, with only a few very fine granules on the odd-numbered interspaces and none on the even-numbered ones; surface appearing glabrous but with a few minute hairs, to be seen only in profile. Declivity (pl. 38, fig. 7) bril-

liantly shining, striae deeply impressed with punctures distinct as on disk; interspaces 1 and 3 strongly convex, each with a few, sparse, fine, obsolescent granules not arranged uniseriately, and a few very fine, indistinct punctures; second interspace nearly as wide as others, less strongly convex, devoid of granules and with very few, minute punctures; vestiture consisting of minute, sparse hairs. Anterior face of mesosternum slightly oblique.

Female.—Similar to male, but with frons wider, frontal rectangle about 0.70 as long as wide, with well-developed arcuate, transverse impression, median carina fine, elevated on lower half; elytral declivity similar to that of male but with hairs slightly larger and more numerous, but still very small and inconspicuous.

This species is very closely allied to *fulgens* but readily distinguished by the pronotal and elytral characters brought out in the descriptions, as well as by the difference in coloration.

Type locality.—Pinehurst, Oreg.

Host.—*Libocedrus decurrens* Torr.

Type material.—Holotype, allotype, and 12 paratypes, U.S.N.M. No. 55402.

Remarks.—The holotype, allotype, and 12 paratypes were taken at Pinehurst, Oreg., by W. J. Buckhorn from the tops of *Libocedrus decurrens*, which they were attacking and killing.

PHLOEOSINUS PUNCTATUS LeConte

PLATE 39, FIGURES 10, 11

Phloeosinus punctatus LeConte, Proc. Amer. Philos. Soc., vol. 15, p. 381, 1876.—SCHWARZ, Ent. Amer., vol. 2, p. 55, 1886.—HOPKINS, Can. Ent., vol. 35, p. 60, 1903; U. S. Div. Ent. Bull. 48, p. 18, 1904.—CURRIE, U. S. Div. Ent. Bull. 53, p. 73, 1905.—SWAINE, New York State Mus. Bull. 134, p. 130, 1909; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 67, 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 171, 1939.

Male.—Black, shining, with elytra reddish brown; 2.14 to 3.2 mm. long, about 2.07 times as long as wide.

Frons rather wide between eyes, frontal rectangle about 0.71 as long as wide; epistomal lobe short; surface black, shining, rather finely, densely granulate-punctate at sides and above; central area deeply, not very broadly concave, with central portion smooth, impunctate, and brightly shining, with a moderately developed, elevated median carina on lower fourth; hairs at sides and above, short, fine, inconspicuous except in profile. Eye nearly exactly three times as long as wide, about half divided by a U-shaped emargination. Antenna with club nearly twice as long as wide, sutures all strongly oblique, sinuate.

Pronotum about 1.20 times as wide as long, widest posteriorly; sides feebly, arcuately converging on posterior third, then more strongly arcuately narrowed, strongly constricted in anterior third, broadly rounded in front; surface black, shining, rather strongly, transversely impressed opposite anterior constriction; disk with very deep, close, moderately coarse punctures, somewhat roughened but not truly granulate; punctures finer and closer in front, rougher, subgranulate at sides; median line not elevated, slightly indefinitely impressed at each side on posterior fourth; lateral calli nearly entirely lacking; hairs fine and short, distinctly longer at each side just anterior to position of lateral calli.

Elytra slightly wider than pronotum, slightly widest behind middle, about 1.34 times as long as wide; sides subparallel on anterior two-thirds, moderately broadly rounded behind; surface brilliantly shining, reddish brown; striae nearly as wide as interspaces, strongly impressed, with punctures rather large, very shallow, moderately spaced, coarser but still shallow at sides, smaller and deeper on declivity; interspaces slightly wider than striae, convex, rugose, granulate, moderately punctured, confusedly, lunately asperate at base, granules confused, coarse but low and rounded, becoming uniseriate serrations near declivity on first and alternate interspaces; appearing glabrous, but with sparse, minute hairs. Declivity (pl. 39, fig. 11) with first, third, and alternate interspaces rather strongly elevated and strongly serrate; first interspace often with some serrations lacking on apical portion, rather sparsely, very finely punctate median to serrations, with a few minute, fine hairs often entirely abraded and always very inconspicuous; third interspace regularly, strongly serrate to apex, where it meets ninth interspace, which also has a few serrations; fifth and seventh with three to five smaller serrations; second interspace much narrower than on disk, often obsolescent behind, flat, devoid of punctures and serrations. Anterior face of mesosternum oblique.

Female.⁵—Black with elytra dark reddish brown, 2.8 mm. long, about 2.18 times as long as wide. Frons slightly flattened, rather coarsely granulate-punctate, with a distinct, elevated median carina. Pronotum with sides arcuately convergent, moderately constricted anteriorly, surface of disk as in male; caudal half of proepisternum smooth, impunctate except at margin. Elytra with striae and interspaces of disk as in male, hairs slightly more conspicuous; declivity (pl. 39, fig. 10) similar to that of male, but with serrations smaller and hairs more abundant and coarser, some of them scalelike.

Type locality.—Oregon.

Host.—Not recorded.

⁵ Description prepared from the first specimen in LeConte's type series.

Location of type series.—LeConte collection, Museum of Comparative Zoology, Cambridge, Mass.

Remarks.—In the LeConte collection the first four specimens are marked as types (cotypes). Three of these are from Oregon and agree with the short description; the fourth so-called type is from Lake Superior and is a different species. Ten additional specimens from California are in LeConte's composite series. Of this number, four represent a different, slightly smaller species.

The United States National Museum collection contains several hundred specimens of *punctatus* taken in Washington, Oregon, and California. The hosts are *Libocedrus decurrens* Torrey, *Thuja plicata* D. Don, and *Juniperus occidentalis* Hooker.

PHLOEOSINUS RUBICUNDULUS Swaine

PLATE 38, FIGURE 9

Phloeosinus rubicundulus SWAINE, Can. Ent., vol. 56, pp. 144, 145, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 176, 1939.

Male.—Piceous to black, with elytra reddish brown to piceous brown; 2.5 to 3.42 mm. long, about 2.07 times as long as wide.

Frons very wide between eyes, frontal rectangle about 0.70 as long as wide, epistomal lobe very short; surface piceous, shining, densely, moderately finely granulate-punctate at sides, more sparsely punctured, not granulate, above; broadly, rather deeply concave in central area between eyes, concavity shining, smooth and nearly devoid of punctures and granules, median carina poorly developed, variable, often appearing as an indefinitely elevated area on epistoma; hairs short, fine, and inconspicuous. Eye more than three times as long as wide, more than half divided by a rather narrow emargination. Antenna with club nearly exactly two times as long as wide, first and second sutures oblique, third suture very strongly oblique.

Pronotum about 1.1 times as wide as long, widest at posterior angles; sides nearly straight and feebly converging on posterior half, then strongly, arcuately narrowed to the definite constriction just behind the broadly rounded anterior margin; surface piceous black, brightly shining, with deep punctures of moderate size, notably sparser than usual as in *punctatus*; sides more closely and roughly punctured, subgranulate; lateral calli small, inconspicuous; median line faint, indefinitely impressed at each side near posterior border; hairs fine, short on disk, longer at sides.

Elytra wider than pronotum, about 1.41 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface shining; striae deeply impressed, much narrower than interspaces, stria punctures of moderate size, shallow, rather closely spaced, interspaces wide and convex, rugose-granulate-

punctate, becoming uniseriately granulate behind, coarser on first, third, and alternate interspaces, punctures rather sparse, each with a short, rather fine hair; interspaces at sides rugose but less strongly granulate. Declivity (pl. 38, fig. 9) less abrupt than in *cupressi* and *nitidus*, striae impressed, narrower than on disk, with smaller punctures; first interspace weakly elevated, wider than on disk, rather roughly, moderately closely punctured, with only two or three isolated serrations; second interspace narrower than first or third, feebly convex, with few punctures, devoid of serrations; third interspace moderately elevated, moderately strongly serrate; fifth and seventh interspaces each with a few serrations; hairs more abundant than on disk, most of them short, stout, and numerous, with a few longer setae arising from bases of serrations. Mesosternum with anterior portion moderately oblique.

Female.—Similar to male in habitus, frons wider between eyes than in male, frontal rectangle 0.67 as long as wide; epistomal lobe nearly lacking, surface convex, moderately shining, densely granulate-punctate throughout, with a strongly elevated, sharp median carina on lower half; elytral declivity with first and third interspaces subequally elevated, and subequally rather weakly serrate; clothed with numerous, small, short, scalelike, cinereous hairs.

Type locality.—Tulare County, Calif.

Host.—*Sequoia washingtoniana* (Wins.) Sudw.

Location of type.—Canadian National Collection.

Remarks.—I have studied about 150 specimens, collected mostly from the giant sequoia but a few were from *Libocedrus decurrens*, at Yosemite, Wawona, General Grant National Park. Sequoia National Park, Mariposa County, Calif. The range seems to be limited to that of its principal host.

PHLOEOSINUS BUCKHORN, new species

Male.—Black, shining, with elytra bright reddish brown; 1.9 to 2.3 mm. long, holotype 2.21 mm. long, about 2.04 times as long as wide.

Frons rather wide between eyes, frontal rectangle about 0.77 as long as wide; epistomal lobe short; surface black, shining, finely and densely granulate-punctate at sides and above; central area deeply, rather narrowly concave, with its central third smooth, impunctate, brightly shining, with a fine, sharply elevated, short median carina on less than the lower third; hairs at sides and above concavity short, fine, and inconspicuous. Eye slightly less than three times as long as wide, more than half divided by a U-shaped emargination. Antenna with club less than twice as long as wide, first and second sutures distinctly oblique, third suture more strongly oblique and sinuate.

Pronotum about 1.18 times as wide as long, widest posteriorly, sides nearly straight and feebly converging on posterior third, middle third strongly arcuately converging, constricted just behind the broadly rounded front margin; surface shining, transversely impressed opposite anterior constriction; disk deeply, rather closely, moderately finely and roughly punctured, not granulate, punctures finer and closer in front; sides more strongly roughened, subgranulate; slightly, indefinitely impressed at each side of median line on posterior third, median line not definitely elevated, with finer and closer punctures; lateral calli poorly developed; pubescence short, fine, and inconspicuous.

Elytra slightly wider than pronotum, about 1.34 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, moderately broadly rounded behind; surface brightly shining, reddish brown; striae about half as wide as interspaces, impressed, stria punctures moderately small, very shallow and usually indistinct, much larger and plainer, but still shallow at sides and on declivity; interspaces convex, rugose-granulate, with fine punctures and a few very fine, short, inconspicuous hairs, granules confused on most of disk, but becoming uniseriate posteriorly. Declivity with first, third, and alternate interspaces strongly convex, first interspace with moderately small serrations, those on third larger and more numerous, fifth, seventh, and ninth interspaces with a few sharp asperities or granules; second interspace less convex, narrowed and nearly obsolete posteriorly; declivital pubescence consisting of short, very fine hairs, lacking on second interspace, scanty on others. Anterior face of mesosternum slightly sloping.

Female.—Similar to male in general habitus; frons wider and shorter, frontal rectangle about 0.70 as long as wide, densely and roughly granulate-punctate, with a broad, rather low carina on lower half; elytral declivity with first and third interspaces strongly convex, the serrations notably smaller than in male.

Similar to *punctatus* but smaller, with more numerous and larger hairs on both pronotum and elytra and with smaller stria punctures and narrower striae on elytra.

Type locality.—Portland, Oreg.

Additional locality.—Pinehurst, Oreg.

Host.—*Thuja plicata* D. Don.

Additional host.—*Libocedrus decurrens* Torrey.

Type material.—Holotype, allotype, and 47 paratypes, U.S.N.M. No. 55403.

Remarks.—The holotype, allotype, and 21 paratypes were collected from bark of western red cedar (*Thuja plicata*), at Portland, Oreg., by W. J. Buckhorn; and 26 paratypes were reared from *Libocedrus decurrens* taken at Pinehurst, Oreg., by W. J. Buckhorn.

PHLOEOSINUS KANIKSU, new species

Male.—Black, with elytra reddish brown; 2.14 to 3.1 mm. long, holotype 2.71 mm. long, exactly 2.0 times as long as wide; allied to *punctatus*.

Frons moderately wide between eyes, frontal rectangle about 0.80 as long as wide; epistomal lobe very short; surface black, shining, densely, moderately granulate-punctate throughout, deeply, rather narrowly concave between eyes, its central area impunctate and brightly shining, with an elevated median carina on lower third; hairs short, fine, inconspicuous. Eye three times as long as wide, more than half divided by a moderately wide U-shaped emargination. Antenna with club slightly less than twice as long as wide, sutures all oblique.

Pronotum about 1.13 times as wide as long, widest at posterior angles; sides on posterior half nearly straight and feebly converging, then strongly, arcuately narrowed to the constriction just behind the broadly rounded front margin; surface black, moderately shining, strongly, transversely impressed just back of anterior margin; disk with deep punctures of moderate size (slightly smaller and not so close as in either *punctatus* or *rubicundulus*), punctures gradually becoming smaller and closer anteriorly on disk, very dense and small near anterior margin, sides not granulate, with punctures denser than on disk; median line feebly elevated on posterior third; lateral calli very small or lacking; hairs short on posterior disk, slightly longer on anterior disk, considerably longer on sides (but not so long as in *rubicundulus*).

Elytra slightly wider than pronotum, about 1.31 times as long as wide, widest at about middle; sides nearly straight and subparallel on anterior two-thirds, very broadly rounded behind; surface reddish brown, moderately shining; striae narrower and not so deeply impressed as in *punctatus* and *rubicundulus*, with somewhat smaller shallow punctures, striae wider and punctures slightly larger on sides; interspaces considerably wider than striae, feebly convex, densely, confusedly granulate-punctate anteriorly, with granules less numerous on posterior part and with little indication of a uniseriate arrangement on disk; hairs moderately short and stout, more numerous and much more conspicuous than in *punctatus* and *rubicundulus*, though still rather sparse. Declivity with striae not so strongly impressed as in its near allies, with the strial punctures less distinct; first and third interspaces elevated and serrate, with serrations distinctly smaller than in either *punctatus* or *rubicundulus*; first interspace with three serrations nearest apex greatly reduced or lacking, median portion finely, rather closely punctured; second interspace nar-

rower than first and third, nearly flat, finely, very sparsely punctured, devoid of serrations; third interspace elevated, moderately finely, regularly serrate, finely punctured; fifth, seventh, and ninth interspaces convex, each with a few small serrations; entire declivity moderately sparsely clothed with fine, short hairs, with a few slightly longer, erect setae from bases of serrations. Anterior face of mesosternum oblique.

Female.—Similar to male in habitus, with frons wider and shorter, frontal rectangle about 0.73 as long as wide, convex, rather coarsely granulate-punctate, with a broad, strongly elevated median carina on lower half; declivity similar to that of male with serrations no smaller than in male, punctures somewhat more numerous, vestiture consisting of short, moderately stout hairs (more numerous than in male), many of them scalelike, and of the usual small number of longer slender hairs from the serrations.

This species is most readily distinguished from *punctatus* and *rubicundulus* by the more rugged sculpture of the discal interspaces of the elytra, the more abundant and conspicuous discal vestiture, and by the vestiture of the elytral declivity which is notably better developed than in *punctatus* and in the females is less scalelike and much less abundant than in *rubicundulus*.

Type locality.—Metaline Falls, Wash.

Additional localities.—Northport, Wash.; Pierce and Kootenai, Idaho.

Host.—*Thuja plicata* D. Don.

Type material.—Type, allotype, and 29 paratypes, U.S.N.M. No. 55404.

Remarks.—The holotype, allotype, and 5 paratypes were taken from *Thuja plicata* near Metaline Falls, Kaniksu National Forest, Wash., by D. DeLeon; 18 paratypes from the same host at Northport, Wash., by F. P. Keen; and 6 paratypes from the same host at Pierce, Idaho, by J. C. Evenden. Other specimens are from Glacier National Park and other localities in northern Montana.

PHLOEOSINUS RUSTI, new species

Male.—Piceous brown to black, with elytra reddish brown; 2.23 to 3.0 mm. long, holotype 2.45 mm. long, nearly exactly twice as long as wide, allied to *punctatus* LeConte.

Frons very wide between eyes, frontal rectangle about 0.69 as long as wide; epistomal lobe very short; surface piceous black, shining, finely and densely granulate-punctate at sides, somewhat more coarsely, less closely punctate and scarcely granulate above; central half moderately concave, with concavity much shallower than in

buockhorni, with its central portion smooth and impunctate; median carina extending from epistomal margin to center of concavity, but rather indistinct and not sharply elevated; hairs at sides and above concavity, short, fine, inconspicuous. Eye more than three times as long as wide, more than half divided by a U-shaped emargination. Antenna with club less than twice as long as wide, all sutures oblique, the third more strongly than others.

Pronotum about 1.16 times as wide as long, widest posteriorly; sides weakly arcuate and feebly convergent, on posterior half, then more strongly arcuate and convergent, constricted just behind the very broadly rounded front margin; surface shining, transversely impressed behind front margin; disk moderately finely, very deeply, rather closely punctate, not granulate, punctures finer and closer in front, sides with punctures smaller and closer than on disk, subgranulate, indefinitely impressed at each side of median line behind; lateral calli lacking; vestiture moderately short and fine, but visible.

Elytra slightly wider than pronotum, about 1.36 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface brightly shining, reddish brown; striae impressed, about one-half (or less) as wide as interspaces, punctures moderately small, close, not deep; punctures larger, shallow, and striae somewhat wider at sides; interspaces convex, rugose-granulate, with a few small punctures bearing short, fine hairs, granules mostly confused, but approaching uniseriate arrangement on posterior half of disk. Declivity with second interspace narrower, nearly flat, smooth and impunctate, first and third strongly convex; first interspace with moderately small serrations, some of those toward apex lacking, finely punctured, with moderately numerous, very fine, short hairs mesad to serrations; third interspace with moderately small serrations, slightly larger toward apex, with a few punctures bearing fine, short hairs; fifth, seventh, and ninth interspaces each with a few small serrations. Anterior face of mesosternum rather steep.

Female.—Similar to male in general habitus but slightly more slender, about 2.11 times as long as wide; frons wider and shorter than in male, frontal rectangle about 0.63 as long as wide, closely, rather roughly granulate-punctate, with a rather fine but distinct median carina on lower half; elytral declivity with first and third interspaces strongly convex, moderately finely serrate throughout, smaller than in male, punctures more numerous, hairs much more numerous and many of those on first interspace short and stout, appearing scalelike.

Type locality.—Metaline Falls, Wash.

Additional localities.—Wind River, Wash.

Host.—*Thuja plicata* D. Don.

Type material.—Holotype, allotype, and 20 paratypes. U.S.N.M. No. 55405.

Remarks.—The holotype, allotype, and 9 paratypes were taken from bark of *Thuja plicata* at Metaline Falls, Wash., by H. J. Rust; and 11 paratypes from *T. plicata*, Wind River, Wash., by J. E. Patterson.

PHLOEOSINUS BAUMANNI Hopkins

Phloeosinus baumannii HOPKINS, Proc. Ent. Soc. Washington, vol. 7, p. 79, 1905.—
SCHEDL, Anal. Escuela Nac. Cienc. Biol., vol. 1, p. 337, 1940.

Male.—Piceous to black throughout except antennae and tarsi; 3.0 to 4.1 mm. long (averaging about 3.75 mm.), about 2.11 times as long as wide; allied to *cupressi* Hopkins and *variolatus* Bruck.

Frons very wide between eyes, frontal rectangle about 0.66 as long as wide, epistomal lobe very short, surface piceous, shining, strongly, densely granulate-punctate, with punctures masked by granules except in median line and above, central area between eyes moderately concave, with a moderately strongly elevated median carina on lower half; hairs fine, erect, more numerous and somewhat longer than usual, inconspicuous except in profile. Eye less than three times as long as wide, about half divided by a U-shaped emargination. Antenna with club slightly more than twice as long as wide, sutures arcuate and oblique.

Pronotum about 1.1 times as wide as long, widest near posterior angles; sides distinctly arcuate on posterior two-thirds, constricted just behind broadly rounded front margin; surface piceous, shining, densely, deeply, rather coarsely punctured on disk, more finely in front, and more finely, densely, and roughly punctured at sides; lateral calli small but usually distinct; surface indefinitely impressed at each side of median line on posterior fourth; hairs fine and rather conspicuous, longer on an area in front of lateral calli.

Elytra scarcely wider than pronotum, about 1.39 times as long as wide; sides nearly straight and subparallel on anterior three-fourths, very broadly rounded behind; surface shining; striae, except the first one, rather weakly impressed, with very coarse, rather deep, close punctures; interspaces scarcely wider than striae on disk, scarcely convex, rather coarsely rugose, punctate-granulate, granules becoming somewhat coarser and uniseriate posteriorly on disk and sides; hairs not abundant, rather small, short and inconspicuous. Declivity very abrupt, serrations coarse, blunt, and dark; first interspace with two to four large black serrations at summit of declivity, with apical five-sixths broad, nearly flat, shining, roughly, moderately coarsely punctured; second interspace much narrower than first or third, shining, with a few punctures; third interspace strongly elevated and

closely, very strongly serrate, with serrations near summit notably higher; fifth, seventh, and ninth interspaces each with a few rather coarse, black serrations; each interspace with a median row of erect setae and more numerous short, broad, scalelike hairs. Mesosternum nearly flat, with anterior portion slightly oblique.

Female.—Similar in habitus to male; frons wider between eyes than in male, frontal rectangle 0.64 as long as wide; nearly flat, densely, rugosely granulate-punctate throughout, with a rather faint median carina on lower half, often interrupted by granules; elytral-declivity with first and third interspaces with strong, black, acute serrations, slightly larger midway on declivity; second interspace flat, closely, roughly punctured, only slightly narrower than others, serrate only at summit; all interspaces moderately closely clothed with short, nearly circular, appressed scales, with a few hairlike setae.

The foregoing descriptions were prepared from the female and male types, U.S.N.M. No. 7517, and about 20 specimens bearing the same data, "Hopk. U. S. 1144; Tacubaya, D. F., Mexico; Baumann, Colr." taken from *Cupressus*. Eight other specimens are from *C. benthami* Endl., Mexico, D. F. The writer has also studied two other lots comprising 14 specimens collected from *Cupressus* at San Juan and Chalco, Mexico, by D. DeLeon.

PHLOEOSINUS VARIOLATUS Bruck

PLATE 39, FIGURES 14, 14a, 15, 15a

Phloeosinus variolatus BRUCK, Pan-Pacific Ent., vol. 7, p. 126, 1931.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 174, 1939.

Male.—Piceous to black throughout except antennae and tarsi; 3.0 to 4.0 mm. long, slightly less than twice as long as wide; very closely related to *baumanni* Hopkins.

Frons wide between eyes, frontal rectangle about 0.74 as long as wide, epistoma very short; surface piceous, strongly, densely granulate-punctate; deeply, moderately broadly concave between eyes, concavity less closely granulate-punctate than rest of frons; median carina on lower half very strongly developed, rather broad and low above, but sharply elevated below to form a strong epistomal tooth; hairs fine, erect, somewhat longer than usual, unusually abundant on epistomal margin. Eye considerably more than three times as long as wide, more than half divided by a rather wide emargination. Antenna about twice as long as wide, with sutures oblique and sinuate.

Pronotum about 1.16 times as wide as long, widest at posterior angles; sides evenly, convergently arcuate, constricted just behind

broadly rounded front margin; surface piceous, brightly shining, rather closely, deeply, coarsely punctured on disk (more coarsely than in *baumanni*), very finely and densely near anterior margin; lateral calli better developed than in *baumanni*; hairs moderately short and fine, more conspicuous than in *baumanni*, much longer and more conspicuous on a considerable area at each side anterior to lateral calli.

Elytra only feebly wider than pronotum, about 1.2 times as long as wide, widest at base; sides nearly straight and subparallel on anterior two-thirds, very broadly rounded behind; surface piceous, shining; striae distinctly but weakly impressed, strial punctures very coarse (even coarser than in *baumanni*), very closely placed; interspaces no wider than striae midway on disk, very strongly, rather coarsely rugose and strongly granulate-punctate (sculpture distinctly coarser than in *baumanni*), with granules coarse, confused anteriorly on disk, becoming uniseriate posteriorly; hairs more abundant, longer and more conspicuous than in *baumanni*. Declivity (pl. 39, figs. 15, 15a) very abrupt, serrations coarse, blunt, and black, first interspace with two to five large, black serrations at summit of declivity, with apical five-sixths broad, nearly flat, shining, roughly, rather coarsely punctured, rarely with one or two rather small, vestigial serrations; second interspace much narrower than first or third, widened at apex, shining, punctured; third interspace strongly elevated, with very coarse, closely placed, black serrations; fifth, seventh, and ninth interspaces elevated, each with several rather coarse, black serrations; declivital interspaces all sparsely clothed with small scalelike hairs, with a few slender hairs at bases of serrations. Mesosternum slightly oblique in front.

Female.—Similar in habitus to male; frons wider between eyes than in male, frontal rectangle about 0.64 as long as wide, weakly convex, transversely impressed between eyes, densely granulate-punctate except in median line above; median carina much stronger than in *baumanni*; finely, sharply elevated, toothlike on epistoma; elytral declivity (pl. 39, figs. 14, 14a) with first and third interspaces strongly elevated and with coarse, black serrations (stronger than in *baumanni*), second interspace very narrow but widened near apex; first three interspaces moderately clothed with numerous short scales and with a few hairlike setae.

Type locality.—Mount Saint Helena, Calif.

Host.—*Cupressus sargentii* Jepson.

Location of type.—California Academy of Science.

Remarks.—In addition to a pair of paratypes lent by J. N. Knull, the writer has studied 41 specimens of this species, all taken from

Cupressus sargentii from the following localities in California: Mount Saint Helena (type locality), Livermore, Middleton, and Cedar Ridge, Alameda County. The collectors are H. E. Burke, F. B. Herbert, R. L. Furniss, E. F. Wohletz, and D. Deleon.

PHLOEOSINUS NITIDUS Swaine

Phloeosinus nitidus SWAINE, Can. Ent., vol. 56, p. 145, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 177, 1939.

Male.—Piceous black, with elytra reddish brown; 2.5 to 3.4 mm. long, about 2.08 times as long as wide. Closely related to *Phloeosinus cupressi* Hopkins.

Frons moderately wide between eyes, slightly narrower than in *cupressi*, frontal rectangle about 0.73 as long as wide, epistomal lobe short; surface piceous, finely, densely granulate-punctate at sides, more sparsely punctured, not granulate above in median fifth, entire median area brightly shining; moderately deeply, not broadly concave between eyes, concavity smooth and impunctate above, very finely subgranulate-punctate on epistoma, with a rather broad, blunt median carina on lower half; hairs short, fine, and inconspicuous. Eye about 3.4 times as long as wide, more than half divided by a rather wide U-shaped emargination. Antenna with club less than twice as long as wide; first two sutures distinctly oblique, third suture more strongly oblique.

Pronotum about 1.1 times as wide as long, widest at posterior angles; sides nearly regularly, convergently arcuate, only slightly constricted just back of the moderately broadly rounded front margin; surface piceous, shining; finely, rather closely, very deeply, somewhat roughly punctured on disk; very finely and densely punctured near anterior margin; sides subgranulately punctured; lateral calli small but distinct; median line scarcely elevated on posterior fifth; surface indefinitely impressed at each side near posterior border; hairs fine and inconspicuous (much shorter than in *cupressi*), hairs just anterior to lateral calli notably longer.

Elytra slightly wider than pronotum, about 1.28 times as long as wide, usually slightly wider at base; sides nearly straight (feebly sinuate) and subparallel on anterior two-thirds, very broadly rounded behind; surface shining, striae deeply impressed, more than half as wide as interspaces, striae punctures large, shallow, close; interspaces on disk rugose-granulate, with fine, sparse punctures, convex granules confused on anterior portion, tending to become uniseriate posteriorly; on sides interspaces little wider than striae, nearly smooth, with granules and rugosities only on posterior portion; hairs short and fine, not abundant. Declivity similar to that of *cupressi* with declivital serrations coarse and dark; first interspace convex and with

two to seven coarse serrations only at summit of declivity, with apical three-fourths to four-fifths flat, shining, finely, rather roughly punctured; second interspace very narrow, flat, shining, with a few punctures; third interspace elevated, with closely placed, dark serrations nearly as coarse as in *cupressi*; fifth, seventh, and ninth moderately convex, each with a few, more widely spaced serrations, smaller than in third interspaces; hairs more numerous than on disk, short, rather fine, more numerous on first and third interspaces. Mesosternum nearly flat with anterior portion slightly oblique.

Female.—Similar to male in habitus; frons wider between eyes than in male, frontal rectangle 0.69 as long as wide, convex, densely granulate-punctate, with an elevated, sharp median carina on lower half; elytra with discal interspaces notably wider and striae punctures smaller than in male; declivity with first and third interspaces elevated and regularly serrate but less so than in *cupressi*, second interspace nearly flat, devoid of serrations, only slightly narrower than third; fifth, sixth, seventh, and ninth with a few serrations; all interspaces from first to fourth on each side with numerous fine punctures and densely clothed with short, broad, cinereous, scalelike hairs and a few slender setae.

Type locality.—Santian National Forest, Oreg.

Host.—Not recorded.

Location of type.—Canadian National Collection.

Remarks.—More than 50 specimens were studied by the writer. All these were derived from *Chamaecyparis nootkatensis* (Lamb.) Sudworth at Mount Rainier National Park, by Keen and Buckhorn, and at Fairfax, Wash., by J. A. Beal.

PHLOEOSINUS CUPRESSI Hopkins

PLATE 39, FIGURES 12, 12a, 13, 13a

Phloesinus cupressi HOPKINS, U. S. Bur. For. Bull. 38, pp. 35-38, 1903; U. S. Div. Ent. Bull. 48, p. 45, 1904.—CURRIE, U. S. Div. Ent. Bull. 53, p. 100, 1905.—SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 181, 1939.

Male.—Piceous with elytra reddish brown to piceous; 2.06 to 3.6 mm. long, about 2.06 times as long as wide.

Frons very wide between eyes, frontal rectangle about 0.68 as long as wide, epistomal lobe short; surface piceous, densely, moderately finely granulate-punctate at sides, roughly punctate, scarcely granulate above in median fifth; central area between eyes broadly, moderately deeply concave, finely punctate-granulate throughout except in median line; median carina nearly entirely lacking, appearing only as an indefinitely elevated small area on epistoma; hairs short, fine, and inconspicuous, scarcely visible except in profile. Eye about 3.16 times

as long as wide, about half divided by a U-shaped emargination, wider than usual. Antenna with club slightly less than twice as long as wide, first two sutures oblique, third suture very strongly oblique.

Pronotum about 1.13 times as wide as long, widest near posterior angles; sides distinctly arcuate, constricted just behind very broadly rounded anterior margin; surface piceous, shining, moderately finely and closely, very deeply punctured on disk, more finely and closely punctured in front, more roughly punctured but not granulate at sides; lateral calli indistinct or lacking; median line lacking or very faint; feebly, indefinitely impressed at each side near posterior border; hairs fine, notably longer at each side anterior to lateral calli.

Elytra wider than pronotum, about 1.33 times as long as wide; sides subparallel on anterior two-thirds, very broadly rounded behind; surface shining; striae deeply impressed, of moderate width, stria punctures close, moderately coarse; interspaces more than twice as wide as striae, convex, rugulose-granulate, granules confused anteriorly, becoming larger and uniseriate posteriorly; punctures fine, giving origin to short, fine, inconspicuous hairs. Declivity (pl. 39, figs. 13, 13a) more abrupt than usual; declivital serrations very coarse and dark; first interspace with three to five dark, coarse serrations only at top of declivity, the apical four-fifths nearly flat, shining, finely, very roughly punctured; second interspace narrower than first and third, nearly flat, shining, with a few punctures; third interspace elevated, with very coarse, dark, closely placed serrations; fifth, seventh, and ninth interspaces moderately convex, each with three to six smaller, more widely spaced serrations; hairs more abundant than on disk, short, rather stout and numerous on first and second interspaces, more scanty elsewhere. Mesosternum nearly flat, with anterior portion slightly oblique.

Female.—Similar to male in general habitus; frons wider than in male between eyes, frontal rectangle about 0.64 as long as wide, convex, densely granulate-punctate throughout, with a strongly elevated sharp median carina on lower half; elytral declivity (pl. 39, figs. 12, 12a) with first and third interspaces strongly elevated and rather coarsely serrate, second interspace flat, distinctly narrower than first or third, closely, finely punctured; fifth, seventh, and ninth interspaces each with a few serrations, smaller than on third but of moderate size; all interspaces from suture to seventh densely clothed with short, broad, scalelike, cinereous hairs, with a few hairlike setae arising from bases of serrations.

This species has never been adequately described, but the original very brief description was supplemented by a good illustration of each sex, by which the species can be readily recognized. The series of this species contains a number of specimens which were before

Hopkins at the time the description was prepared and one of these is marked "type," although it had apparently never been entered in the type book or assigned a type number. Others of the same lot I have designated paratypes.

Type locality.—Golden Gate Park, Calif.

Additional locality.—Berkeley, Calif.

Host.—*Cupressus macrocarpa* Gordon.

Type material.—Holotype and nine paratypes, U.S.N.M. No. 55406.

Remarks.—In addition to the type series the writer has studied about 90 specimens from Alameda County, Berkeley, Palo Alto, Los Gatos, Monterey, Watsonville, and Salinas, Calif. All but 1 lot are from *Cupressus macrocarpa* Gordon. One single lot was taken from *Sequoia sempervirens* (Lambert) Endl., in Alameda County.

PHLOEOSINUS CRISTATUS (LeConte)

PLATE 40, FIGS. 16, 17

Hylesinus cristatus LECONTE, Trans. Amer. Ent. Soc., vol. 2, pp. 169, 170, 1868; Proc. Amer. Phil. Soc., vol. 15, p. 181, 1876.

Phloeosinus cristatus (LeConte) RILEY AND HOWARD, Insect Life, vol. 5, p. 262, 1893.—BLANDFORD, Biol. Centr. Amer., Coleop., vol. 4, pt. 6, p. 160, 1897.—HOPKINS, U. S. Bur. For. Bull. 38, pp. 39, 40, fig. 4, 1903.—SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 180, 1939.

Male.—Piceous black, with elytra reddish brown to piceous brown; 2.8–4.0 mm. long, about 1.99 times as long as wide.

Frons very wide between eyes, frontal rectangle about 0.65 as long as wide, epistomal lobe short; surface piceous, densely, moderately coarsely granulate-punctate, rather deeply, not widely concave between eyes, with median carina extending from above center of concavity to epistomal margin, elevated and moderately acute, continued as low, interrupted elevation on upper part of frons, shining and impunctate above; hairs short, fine, and very inconspicuous. Eye about 3.5 times as long as wide, about two-thirds divided by a deep U-shaped emargination. Antenna with club less than twice as long as wide, all sutures oblique.

Pronotum about 1.08 times as wide as long, widest at posterior angles; sides regularly arcuate and convergent from base to the weak constriction just behind the moderately broadly rounded anterior margin; surface moderately shining, with close, deep punctures of moderate size on disk, much smaller and denser near front margin, coarser and subgranulate on sides; lateral calli small and indistinct, sometimes lacking; median line scarcely elevated, on posterior fourth only; hairs very short, dark in color, inconspicuous.

Elytra scarcely wider than pronotum, about 1.28 times as long as wide; sides subparallel on anterior two-thirds, broadly rounded behind; surface reddish to piceous brown, moderately shining; striae narrow, moderately deeply impressed, stria punctures rather small, longer than wide, not closely spaced; interspaces wide, convex, densely, finely punctate-granulate; hairs numerous, very short and fine, very inconspicuous. Declivity (pl. 40, fig. 17) moderately steep; first interspace slightly convex, finely, deeply, closely punctured, devoid of serrations except a few minute ones at summit of declivity; second interspace scarcely convex, finely and closely punctured, without serrations, only slightly narrower than others; third interspace very strongly elevated, with coarse, closely placed, black, blunt serrations; fifth to ninth interspaces each with a few serrations, rather coarse and four to six in number on fifth and seventh, smaller and less numerous on others; first and second interspaces clothed with moderately abundant scalelike hairs, the others with less abundant scales. Mesosternum nearly flat, with anterior portion slightly oblique.

Female.—Similar to male in general habitus, frons wider between eyes than in male, frontal rectangle about 0.61 as long as wide, convex, densely granulate-punctate at sides and on lower half, more coarsely punctate and scarcely granulate above, with a distinct, arcuate, transverse impression between eyes; median carina fine, sharply elevated, on lower half; elytral declivity (pl. 40, fig. 16) with first interspace slightly convex, with small, sometimes obsolescent serrations, closely punctured and clothed with numerous scales; second interspace nearly flat, closely punctured and clothed with scales; third interspace with a row of moderately coarse, black serrations, with spaces between covered with scales; with smaller serrations on the more lateral interspaces.

The type of *Phloeosinus cristatus* (LeConte) is in the Ulke collection at the Carnegie Museum, Pittsburgh, Pa., and I have not seen it. About a hundred specimens have been studied from *Cupressus* sp. or *C. macrocarpa* Gordon taken at Placerville, Oroville, Reedley, Fresno, Sonora, Walnut Creek, and North Hollywood, Calif., and from *C. glabra* Sudworth, or "arborvitae," and introduced varieties of *Cupressus* in the Gila Valley of Arizona.

PHLOEOSINUS CHIRICAHUA, new species

Male.—Black with elytra dark reddish brown to piceous; 2.77 to 3.5 mm. long, holotype 3.0 mm. long, 1.93 times as long as wide; closely allied to *cristatus* (LeConte).

Frons very wide between eyes, frontal rectangle about 0.61 as long as wide, epistomal lobe very short; surface shining, densely, moderately finely granulate-punctate at sides and below, more coarsely and

sparsely punctured and subgranulate above; moderately deeply and widely concave between eyes, with a median carina on lower half, rather weakly elevated except just above epistomal margin, smooth above in median line; hairs short, fine, inconspicuous. Eyes more than three times as long as wide, about half divided by a U-shaped emargination. Antenna with club nearly twice as long as wide, all sutures oblique and sinuate.

Pronotum about 1.08 times as wide as long, widest near posterior angles; sides feebly arcuate and convergent on posterior two-thirds, then more rapidly narrowed, constricted just behind the broadly rounded front margin; surface shining, with close, deep, moderate-sized punctures on disk, which become smaller and denser near anterior margin, closer, rougher, and subgranulate on sides; lateral calli small; median line broadly, weakly elevated from posterior border to center of disk; hairs rather numerous, but short, inconspicuous except in profile, slightly longer at each side anterior to lateral calli.

Elytra scarcely wider than pronotum, about 1.20 times as long as wide (slightly stouter than in *cristatus*); sides subparallel on anterior two-thirds, very broadly rounded behind; surface brightly shining; striae moderately narrow, moderately strongly impressed, stria punctures moderately small, not longer than wide, separated by considerably more than own diameter; interspaces wide, convex, densely, finely punctate, with granules less numerous than in *cristatus*, confused in arrangement, with little tendency toward becoming uniseriate on disk; hairs numerous, short, and fine on anterior disk, becoming scale-like on posterior disk and declivity, inconspicuous except in profile. Declivity sloping as in *cristatus*; first interspace narrower than on disk, weakly convex, finely, moderately closely punctured, devoid of serrations; second interspace wider than first, shining, finely, deeply, moderately closely punctured, without serrations; third interspace strongly elevated, with coarse, closely placed, dark-colored, blunt serrations, finely punctured; fifth and seventh interspaces each with four to eight smaller, sharper serrations; sixth and eighth interspaces with two to five small granules; declivity rather sparsely clothed (more sparsely than in *cristatus*) with small scalelike hairs. Mesosternum flat, with anterior portion scarcely at all oblique.

Female.—Similar to male in general habitus; frons wider between eyes than in male, frontal rectangle about 0.57 as long as wide; convex, indefinitely impressed between eyes, surface shining, rather finely, densely granulate-punctate except in median area above, median carina scarcely elevated on lower half, more or less broken up by granules but elevated into a small tooth on epistomal margin; elytra with interspaces on disk more strangely granulate than in male,

the granules becoming uniseriate midway on disk, first interspace much narrower than others; declivity with first interspace narrow, convex, with small, rather sparse serrations; second interspace wider than first, flat, closely, finely punctured, without serrations; third interspace elevated and armed with a row of dark-colored, pointed serrations or granules; entire declivity clothed with moderately abundant, flat, scalelike hairs.

Type locality.—Chiricahua National Monument, Ariz.

Additional localities.—Oak Creek Canyon, Santa Catalina Mountains, Gila Valley, Ariz.; and Cuchuta, Sonora, Mexico.

Host.—*Cupressus arizonica* Greene.

Additional hosts.—*Cupressus glabra* Sudworth, *Juniperus pachyphloea* Torrey.

Type material.—Holotype, allotype, and 21 paratypes, U.S.N.M. No. 55407.

Remarks.—The holotype, allotype, and four paratypes were taken from *Cupressus arizonica* at Chiricahua, Ariz., by D. DeLeon; five paratypes from *Cupressus* in Oak Creek Canyon by DeLeon; one paratype from *Juniperus pachyphloea* Torr., Santa Catalina Mountains, by M. Chrisman; six paratypes from *C. arizonica*, Safford, Ariz., by Rex King; and two paratypes from cypress, Gila Valley, Ariz., by H. B. Wales.

The two species *Phloeosinus cristatus* (LeConte) and *P. chiricahua*, new species, are rather closely related, and their distribution overlaps to a certain extent in Arizona. *P. chiricahua* seems to be more numerous in extreme southern Arizona, and the writer has seen no specimens of true *cristatus* from the Chiricahua and Oak Creek Canyon areas, while in the Gila Valley *cristatus* is much more abundant than *chiricahua*; and the two species may occasionally be found in the same material.

PHLOEOSINUS SEQUOIAE Hopkins

PLATE 40, FIGURES 18, 18a, 19, 19a

Phloeosinus sequoiae HOPKINS, U. S. Bur. For. Bull. 38, pp. 33-35, fig. 1, pl. 12, 1903; U. S. Div. Ent. Bull. 48, pp. 18, 45, 1904.—CURRIE, U. S. Div. Ent. Bull. 53, p. 74, 1905.—SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, pp. 69, 70, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 179, 1939.

Male.—Black with elytra reddish brown to piceous; 3.25-4.25 mm. long, about 2.16 times as long as wide.

Frons very wide between eyes, frontal rectangle about 0.66 as long as wide, epistomal lobe nearly lacking; surface piceous black, brightly shining; densely rugose, granulate-punctate below, with rugae often in approximate rows diverging from epistomal margin,

with punctures somewhat larger and sparser, subgranulate above; impressed to shallowly concave between eyes, with an indistinct, feebly elevated median carina on lower half; hairs short, fine, and inconspicuous. Eye more than three times as long as wide, more than half divided by a broad U-shaped emargination. Antenna with club about twice as long as wide, first two sutures slightly oblique, third strongly oblique.

Pronotum about 1.09 times as wide as long, widest at posterior angles; sides nearly straight and very feebly convergent on posterior half, then strongly arcuately convergent, constricted just behind the broadly rounded anterior margin; surface brightly shining, with deep punctures of moderate size and density (slightly finer and sparser than in *cristatus*), closer and finer near anterior margin, rougher and subgranulate on sides; lateral calli small, almost lacking; median line feebly elevated only on posterior eighth; hairs very fine and short, very inconspicuous, surface appearing glabrous.

Elytra scarcely wider than pronotum, about 1.40 times as long as wide; sides subparallel on anterior two-thirds, very broadly rounded behind; surface brightly shining; striae narrow, distinctly impressed, stria punctures fine, not close; interspaces wide, moderately convex, with rugae and low, transverse granules, very fine punctures bearing minute hairs. Declivity (pl. 40, figs. 19, 19a) steep, brightly shining; first interspace feebly convex, devoid of serrations, with only a few, fine, obsolescent punctures; second interspace flat, brightly shining, narrowed posteriorly and becoming obsolete on apical sixth, with no serrations and only a few obsolescent punctures; third interspace very strongly elevated, with very coarse, black serrations; fifth, seventh, and ninth interspaces each with a few moderately coarse, black serrations; sixth and eighth interspaces each with a few granules or small serrations; declivity nearly glabrous with only a few small hairs on the more lateral interspaces. Mesosternum with anterior portion somewhat oblique.

Female.—Similar to male in general habitus; frontal rectangle about 0.65 as long as wide; convex, impressed between eyes, with median carina elevated and distinct on lower half, densely granulate-punctate at sides, more coarsely punctured and subgranulate above; elytral declivity (pl. 40, figs. 18, 18a) shining, first interspace moderately elevated, with a few granulelike serrations and a few very small punctures; second interspace narrowed behind, becoming obsolete on posterior eighth, devoid of serrations and with a few very fine punctures; third interspace strongly elevated, with a row of black, moderately coarse serrations; lateral interspaces with a few moderate serrations on fifth, seventh, and ninth, and with small

granules on sixth and eighth; declivity scantily clothed with small, slender hairs and a few small scales, usually abraded.

Type locality.—Guerneville, Sonoma County, Calif.

Host.—*Sequoia sempervirens* (Lambert) Endlicher.

Type material.—Holotype, allotype, and 7 paratypes, U.S.N.M. No. 55408.

Remarks.—This species has never previously been adequately described, but Hopkins' very brief characterization was accompanied by biological data and by a figure which make it possible to recognize it. Hopkins' description was based on a study of a series of eight specimens taken by him from the bark of recently felled redwood trees, near Guerneville, Sonoma County, Calif. The collection in the National Museum also contains lots taken from redwood at Duncan's Mills, Woodside, Muir Woods, Fieldbrook, Eureka, Los Gatos, and Gasquet, all in California; in *Cupressus*, San Mateo County, Calif.; and in redwood, Brookings, Oreg.

PHLOEOSINUS SQUAMOSUS, new species

PLATE 40, FIGURES 20, 20a, 21

Male.—Black with elytra reddish brown to piceous; 3.4 to 4.1 mm. long, holotype 3.50 mm. long, about 2.09 times as long as wide; closely allied to *sequoiae* Hopkins.

Frons wide between eyes, frontal rectangle about 0.69 as long as wide, epistomal process nearly lacking; surface piceous, brightly shining, densely rugose-granulate-punctate below and at sides, with little tendency toward formation of aciculations, more coarsely, deeply, and roughly punctured above, weakly granulate; very widely, rather deeply concave between eyes, with a poorly developed median carina on lower half, often not reaching the epistomal margin, median line above concavity slightly elevated and devoid of punctures; hairs fine, moderately short, inconspicuous. Eye about 3.5 times as long as wide, more than half divided by a wide U-shaped emargination. Antenna with club slightly more than twice as long as wide, sutures all strongly oblique.

Pronotum about 1.15 times as wide as long, widest at posterior angles; sides nearly straight and slightly convergent on posterior half, then rather abruptly, arcuately narrowed to the constriction just behind the moderately broadly rounded anterior margin; surface black, moderately shining, with very deep, moderately coarse punctures, very closely spaced, with the interstices somewhat roughened, subgranulate (coarser, closer, and rougher than in *sequoiae*); piceous brown near anterior margin with very fine, very dense punctures; sides weakly granulate; lateral calli rather small, median line feebly

elevated on posterior half of disk; hairs short and fine, but notably longer than in *sequoiae*.

Elytra slightly wider than pronotum, about 1.34 times as long as wide; sides subparallel on anterior two-thirds, very broadly rounded behind; surface shining; striae narrow, rather strongly impressed, with stria punctures fine and rather close; interspaces wide, convex, strongly granulate-punctate and rugose, the granules both coarser and more numerous than in *sequoiae*, confused, with little evidence of uniseriate arrangement on disk; hairs on disk small and rather short, but not minute as in *sequoiae*. Declivity (pl. 40, fig. 21) steep, brightly shining, first interspace weakly convex, without serrations, with a few small punctures bearing minute hairs; second interspace nearly flat, brightly shining, narrowed posteriorly and obsolete on apical sixth, without serrations and with a few minute puncture-bearing minute hairs; third interspace strongly elevated, with coarse, black serrations, often as coarse as in *sequoiae* but sometimes considerably smaller; fifth and seventh interspaces each with three to five moderately coarse serrations. Mesosternum somewhat oblique anteriorly.

Female.—Similar to male in habitus; frontal rectangle about 0.69 as long as wide; convex, impressed on a triangular area between eyes, with a rather weak median carina on lower half, slightly stronger than in male, surface shining, strongly granulate-punctate throughout, hairs much stouter and longer than in female of *sequoiae*; elytral declivity (pl. 40, figs. 20, 20a) with first interspace moderately convex, surface shining, densely, finely punctured, with a few granule-like, fine serrations (or often lacking these); second interspace flat, nearly obsolete at apex, finely, densely punctured, without serrations; third interspace strongly elevated, with a row of rather large, black serrations, with its sides finely, rather closely punctured; lateral interspaces with a few small to medium-sized serrations on each, and each with fine punctures, sparser than on the first three interspaces; surface of first three interspaces clothed with numerous flat, scale-like hairs, lateral interspaces with much sparser but similar scales and with a few moderately short, bristlelike hairs.

This species is closely related to *sequoiae* but is easily separated on the basis of a number of characters mentioned in the description. It averages slightly smaller than *sequoiae* and is slightly stouter. The frons shows constant small differences, but perhaps the most readily seen characters have to do with the vestiture of head, pronotum, and elytra, which in *sequoiae* is usually minute, while in *squamosus* it is both longer and stouter. The declivital vestiture in the female is particularly useful, for in *squamosus* this is abundant

and distinctly scalelike while in *sequoiae* it is much scantier and for the most part hairlike. Swaine, in Canadian barkbeetles, page 70, does not distinguish this species from *sequoiae*, for in referring to *sequoiae* he considers it as "probably the common larger *Phloeosinus* of British Columbia cedar." This is really *squamosus*.

Type locality.—Naselle, Wash.

Other localities.—Hoquiam, Kent, Port Angeles, Wash.

Host.—*Thuja plicata* D. Don.

Additional host.—*Libocedrus decurrens* Torrey.

Type material.—Holotype, allotype, and 65 paratypes, U.S.N.M. No. 55409.

Remarks.—The holotype, allotype, and 45 paratypes were collected from *Thuja plicata* by W. J. Buckhorn, at Naselle, Wash.; 2 paratypes from *T. plicata* by H. E. Burke, at Kent, Wash.; 12 paratypes from *T. plicata* by Burke, at Hoquiam, Wash.; and 2 paratypes from *Libocedrus decurrens* by A. D. Hopkins, at Port Angeles, Wash.

PHLOEOSINUS TAXODII Blackman

PLATE 41, FIGURES 22, 23

Phloeosinus taxodii BLACKMAN, Mississippi Agr. Exp. Sta. Techn. Bull. 11, p. 61, 1922.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 174, 1939.

Male.—Piceous to black, with elytra reddish brown; 2.1 to 3.0 mm. long, about 2.0 times as long as wide; allied to *dentatus* (Say).

Frons moderately wide between eyes, frontal rectangle about 0.76 as long as wide, epistomal lobe short; surface piceous, densely, rather finely punctate-granulate at sides, middle third punctate, scarcely granulate above, shining and nearly impunctate below, moderately deeply, widely, transversely impressed in an arcuate area between eyes; median carina bisecting impression, usually moderately developed; hairs short and fine, inconspicuous except in profile. Eye slightly more than three times as long as wide, more than half divided by a V-shaped emargination. Antenna with club 1.9 times as long as wide, sutures sinuate, first two distinctly oblique, third strongly oblique.

Pronotum about 1.13 times as wide as long, widest near base; sides arcuate and converging on posterior two-thirds, strongly constricted in anterior third, broadly rounded in front, weakly impressed across dorsum in front; surface moderately shining, punctures moderately small, close, and very deep on disk (somewhat coarser and closer than in *dentatus* Say), finer and denser in front, roughened, subgranulate at sides; median line evident on posterior third, with surface indefinitely impressed at each side;

lateral calli nearly lacking; hairs fine and short, fairly abundant but inconspicuous.

Elytra wider than pronotum, about 1.32 times as long as wide, widest at about middle; sides subparallel and nearly straight (feebly arcuate) on anterior two-thirds, moderately broadly rounded behind; surface moderately shining; discal striae narrow, strongly impressed (slightly coarser than in *dentatus*), punctures small, distinct, not close, notably larger and striae notably wider on sides, discal striae not so strongly outcurved near base as in *dentatus*; interspaces wide (not so wide as in *dentatus*), nearly flat, densely, rather finely, confusedly granulate, with larger granules becoming uniseriate on posterior disk; hairs rather abundant, short, fine, rather conspicuous. Declivity (pl. 41, fig. 22) with first and third interspaces as wide as on disk, strongly convex, with numerous, crowded, coarse, black, blunt-pointed serrations (more numerous, coarser, and with the ends not so sharp as in *dentatus*); second interspace as wide as third but narrower than on disk, nearly flat, shining, devoid of granules or serrations except for one or two near apex, but with fine punctures; fifth to ninth interspaces each with several rather coarse, blunt serrations; all interspaces with rather numerous short hairs, none of them scalelike. Mesosternum nearly flat, the anterior portion not precipitous, only feebly oblique.

Female (from holotype).—Similar to male in general habitus; frons wider between eyes than in male, about 0.66 as long as wide, convex, weakly impressed between upper angles of eyes, strongly, closely granulate-punctuate, with a rather weak median carina on lower half; elytral declivity (pl. 41, fig. 23) with first and third interspaces more strongly convex than second, weakly serrate (more weakly than in *dentatus*), second interspace with only a few vestigial serrations or granules (sometimes less numerous and smaller than in *dentatus*).

This species is closely allied to *dentatus* Say but differs as follows: The frontal rectangle is narrower in the male. The pronotal punctures are slightly coarser and closer. The elytral striae are slightly wider than in *dentatus* and not so strongly outcurved near the base. The discal interspaces are slightly narrower. The serrations on the second and third interspaces of the male are more numerous, coarser, and blunter. The second declivital interspace of the female has smaller and fewer (vestigial) serrations or granules than in *dentatus*.

Type locality.—Columbus, Miss.

Host.—*Taxodium distichum* (L.) L. C. Rich.

Type material.—Holotype and five paratypes, U.S.N.M. No. 55410.

Remarks.—I have studied more than 60 specimens besides the long type series of 125 specimens. All these specimens are from southern cypress, *Taxodium distichum*, and were taken in numerous localities in Louisiana, Florida, North Carolina, and South Carolina, as well as in Mississippi.

PHLOEOSINUS DENTATUS (Say)

PLATE 41, FIGURE 24

Hylurgus dentatus SAY, Journ. Acad. Nat. Sci. Philadelphia, vol. 5, p. 258, 1825.—HARRIS, Treatise on some of the insects of New England which are injurious to vegetation, ed. 2, p. 77, 1852.—FITCH, Trans. New York Agr. Soc., vol. 4, p. 750, 1857.—LECONTE, Complete writings of Thomas Say on the entomology of North America, vol. 2, p. 319, 1859.

Hylestinus dentatus (Say) LECONTE, Trans. Amer. Ent. Soc., vol. 2, p. 170, 1868.

Phloeosinus dentatus (Say) LECONTE, Proc. Amer. Philos. Soc., vol. 15, p. 381, 1876.—EICHHOFF and SCHWARZ, Proc. U. S. Nat. Mus., vol. 18, p. 608, 1896.—BLANDFORD, Biol. Centr.-Amer., Coleop., vol. 4, pt. 6, p. 160, 1897.—HOPKINS, U. S. Div. Ent. Bull. 48, p. 25, 1904.—CURRIE, U. S. Div. Ent. Bull. 53, p. 81, 1905.—SWAINE, New York State Mus., Bull. 134, p. 129, 1909; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, pp. 68, 70, 1918.—BLACKMAN, Mississippi Agr. Exp. Sta. Techn. Bull. 11, p. 60, 1922.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 169, 1939.

Dendroctonus (?) *graniger* EICHHOFF, Berlin. Ent. Zeitschr., vol. 12, p. 147, 1868.

Phloeosinus graniger (Eichhoff) CHAPUIS, Mem. Soc. Sci. Liège, ser. 2, vol. 3, p. 248, 1873 (author's extract issued 1869, p. 39).—LECONTE, Proc. Amer. Philos. Soc., vol. 15, pp. 382, 436, 437, 1876.—EICHHOFF and SCHWARZ, Proc. U. S. Nat. Mus., vol. 18, pp. 608, 610, 1896 (= *dentatus* Say).

Dendroctonus (?) *haagii* EICHHOFF, Berlin. Ent. Zeitschr., vol. 12, p. 148, 1868.

Phloeosinus haagii (Eichhoff) CHAPUIS, Mem. Soc. Sci. Liège, ser. 2, vol. 3, p. 248, 1873 (author's extract issued 1869, p. 38).—EICHHOFF and SCHWARZ, Proc. U. S. Nat. Mus., vol. 18, pp. 608, 610, 1896 (= *dentatus* Say).

Phloeosinus enisus BLACKMAN, Mississippi Agr. Exp. Sta. Techn. Bull. 10, p. 56, 1921; Mississippi Agr. Exp. Sta. Techn. Bull. 11, pp. 60, 61, 1922 (new synonymy).

Male.—Piceous-brown to black; 2.25 to 2.8 mm. long, about 1.93 times as long as wide; with rather abundant, short, gray pubescence.

Frons rather wide between eyes, frontal rectangle about 0.67 as long as wide, epistomal lobe very short, nearly lacking; surface piceous, closely, finely, deeply punctate-granulate, less granulate above; moderately deeply and widely, transversely impressed between eyes, with a median carina on lower half, often indistinct; hairs short and fine. Eye slightly less than three times as long as wide, more than half divided by a V-shaped emargination. Antenna with club less than twice as long as wide, sutures nearly straight and slightly oblique.

Pronotum about 1.1 times as wide as long, slightly widest at posterior angles; sides arcuate and gradually convergent. moderately constricted just behind moderately broadly rounded front margin, and slightly impressed across dorsum; surface piceous, shining,

moderately finely, very deeply, closely punctured on disk, punctures finer and closer in front, subgranulate-punctate on sides; median line variably, usually weakly elevated, punctured; lateral calli small or absent; pubescence short, fairly abundant but not conspicuous.

Elytra wider than pronotum, about 1.25 times as long as wide, widest behind middle; sides nearly straight on anterior two-thirds, moderately broadly rounded behind; surface shining; striae on disk very narrow, rather strongly impressed, punctures fine and obscure, striae notably wider on sides; interspaces very wide, flat, densely and strongly granulate (more finely than in *canadensis* Swaine), with a few coarser asperities, irregular on anterior disk, but becoming uniseriate posteriorly. Declivity (pl. 41, fig. 24) with first and third interspaces strongly convex, with moderately large to large (variable) serrations; second interspace weakly convex, about as wide as others, shining, punctate, serrations lacking except for one to three small granules near apex; fifth, sixth, seventh, eighth, and ninth interspaces each with several small serrations or moderately large granules; all interspaces with small, more or less thickened hairs, first and third with erect setae from base of each serration. Anterior face of mesosternum rather steeply oblique.

Female.—Similar to male in habitus; frons wider between eyes than in male, frontal rectangle about 0.66 as long as wide, convex, with median two-thirds flattened, feebly, transversely impressed, closely granulate-punctate throughout, with a fine, elevated median carina on lower half; elytral declivity with all interspaces nearly equally wide and convex and all rather weakly serrate, first and third only slightly more strongly convex and serrations only slightly larger than on second.

Two cotypes of *Phloeosinus graniger* (Eichhoff), received many years ago from Eichhoff and declared by Eichhoff and Schwarz (1896) to be identical with *P. dentatus* (Say), were used, together with other specimens, in the preparation of the description of the male. In like manner, a cotype of *P. haagii* (Eichhoff), a female, was used together with other specimens in preparing the description of the female.

Phloeosinus enicrus Blackman, described from Mississippi in 1921, represents a variation of *P. dentatus* (Say) and should also be placed in the synonymy.

Phloeosinus dentatus is more widely distributed than any other American species of the genus. It occurs from New Hampshire to Georgia and westward to Texas and Nebraska. Practically every State within that area is represented in the collection of about 600 specimens. The most common host is *Juniperus virginiana* L., but it is not uncommon in *Chamaecyparis thyoides* (L.) B. S. and P. and *Thuja occidentalis* L.

PHLOEOSINUS DELEONI, new species

Male.—Black with elytra reddish to piceous brown; 2.86 to 3.22 mm. long, holotype 3.2 mm. long, nearly exactly twice as long as wide; allied to *dentatus*, etc.

Frons moderately wide between eyes, frontal rectangle about 0.70 as long as wide, epistomal lobe very short; surface black, rather feebly shining; densely and rather coarsely punctate-granulate; very widely, moderately deeply, transversely concave, with a median carina on lower half, most strongly elevated just above epistomal margin, carina often continued above concavity as an indefinitely elevated area; hairs fine and short, rather more numerous than usual. Eye more than three times as long as wide, more than half divided by a narrow V-shaped emargination. Antenna with club slightly more than twice as long as wide, sutures all oblique.

Pronotum about 1.16 times as wide as long, widest near posterior angles; sides strongly arcuate and converging to lateral constriction just back of broadly rounded front margin, distinctly impressed across dorsum; surface black, moderately shining, very deeply, densely, moderately finely but roughly punctured, punctures often arranged in irregular longitudinal lines of from 3 to 12 or more with cross partitions below level of surface; sides punctate-granulate; median line slightly elevated, impunctate in middle third; lateral calli rather small; hairs short, fine, and inconspicuous.

Elytra slightly wider than pronotum, about 1.27 times as long as wide; sides subparallel on anterior two-thirds, moderately broadly rounded behind; surface shining, striae deeply impressed, about half as wide as interspaces, stria punctures of moderate size and spacing; interspaces moderately wide, convex, densely granulate-punctate, with numerous asperities, which are confused on anterior disk, but become coarsely, rather sparsely uniseriate on posterior third of first, third, and alternate interspaces; sides with striae wider and punctures coarser, interspaces with asperities less numerous on anterior half, uniseriate behind as on disk; hairs on disk and sides moderate in number, short, rather stout, becoming flat and somewhat scalelike behind. Declivity with first and third interspaces moderately convex, each with from four to eight rather widely spaced, sharp, black teeth, surface moderately punctured; second interspace wide, nearly flat, shining, moderately punctured, devoid of teeth or serrations except for one tooth near apex; fifth to ninth interspaces each with a few teeth, only slightly smaller than on first and third; declivity rather sparsely clothed with scalelike hairs and a few slender setae from bases of serrations. Mesosternum rather obliquely declivitous in front.

Female.—Similar in general habitus; frons much wider between eyes, frontal rectangle about 0.65 as long as wide, rather coarsely granulate-punctate, indefinitely, transversely impressed between eyes, with a fine median carina on lower half; elytra with striae wider than in male, interspaces more densely granulate, with posterior uniseriate asperities much smaller; declivity with all of interspaces nearly equally, finely serrate; first and third interspaces moderately strongly convex, second interspace less strongly convex; vestiture similar to that of male, but with scales slightly more numerous.

Type locality.—Jacala, Hidalgo, Mexico.

Host.—*Juniperus flaccida* Schlechtendal.

Type material.—Holotype, allotype, and eight paratypes, U.S.N.M. No. 55411.

Remarks.—The holotype, allotype, and eight paratypes were taken from *Juniperus flaccida* Schlecht. at Jacala, Hidalgo, Mexico, by D. DeLeon, in whose honor the species is named.

PHLOEOSINUS JUNIPERI Swaine

PLATE 41, FIGURE 25

Phloeosinus juniperi SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 1, p. 10, 1917; Canada Dept. Agr. Ent. Branch, Bull. 14, pt. 2, p. 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 172, 1939.

Male.—Piceous black, with elytra reddish brown; 3.0–3.6 mm. long, about 2.08 times as long as wide.

Frons wide between the eyes, frontal rectangle about 0.68 as long as wide, epistomal lobe very short, nearly lacking; surface piceous, somewhat shining, strongly granulate-punctate (more coarsely than in *dentatus*), broadly, arcuately, transversely impressed (sometimes shallowly, subtriangularly concave) between eyes, with a variable median carina (often nearly entirely lacking), strongest midway of impression. Eye more than three times as long as wide, less than half divided by a wide emargination. Antenna with club nearly twice as long as wide, sutures all distinctly oblique.

Pronotum about 1.17 times as wide as long, widest at posterior angles; sides regularly, arcuately convergent on posterior three-fourths, constricted just behind moderately broadly rounded front margin, and distinctly impressed across dorsum; surface piceous, shining, with very deep, moderately closely placed, moderately coarse punctures, finer and closer in front, subgranulate-punctate at sides; median line feebly to moderately elevated on posterior two-thirds, median third more strongly elevated and often impunctate; lateral calli usually rather small but distinct; hair fine, short, inconspicuous.

Elytra distinctly wider than pronotum, about 1.32 times as long as wide, widest behind middle; sides feebly arcuate, subparallel, semi-circularly rounded behind; surface reddish brown, shining; striae moderately wide and distinctly impressed on disk, with punctures moderately small and close (striae distinctly wider and punctures coarser than in *dentatus*), striae notably wider and punctures coarser on sides; interspaces about twice as wide as striae, feebly convex on disk, densely granulate-punctate, with many fine and fewer coarse granules, confused on most of disk, but coarser granules becoming uniserial toward declivity, interspaces narrower on sides, with granules less numerous; hairs short, fine, inconspicuous (much less numerous and smaller than in *dentatus*). Declivity with first and third interspaces elevated; the first with numerous large, dark, sharp serrations, some obsolescent, others obsolete, finely and closely punctured; third interspace with more numerous, somewhat smaller serrations, with fewer punctures; second interspace shining, nearly flat, about as wide as first, wider than third, finely, moderately sparsely punctured, with only one or two small serrations near apex; fifth and seventh interspaces convex, each with four or five small serrations and only a few punctures; all declivital interspaces with moderately sparse, short, yellowish hairs, some of them scalelike. Anterior face of mesosternum short, moderately oblique.

Female.—Similar to male in habitus; frons very wide between eyes, frontal rectangle about 0.63 as long as wide, convex, with wide, shallow postepistomal impression, densely, coarsely granulate-punctate, median carina obsolescent; elytral declivity with serrations similar in arrangement to those of male, but much smaller, second interspace often with several small serrations, sometimes with only one at apex, punctures close and fine throughout; entire declivity rather densely clothed with numerous, yellowish, flattened, scalelike hairs, with a few fine, rather short, erect setae from bases of serrations.

Phloeosinus juniperi was described from specimens taken by Hopping, Scaffold Meadow, Tulare County, Calif. No host was mentioned. The writer has studied more than 90 specimens, including 4 from the type locality collected by Hopping and J. M. Miller. Other specimens were taken at Yosemite National Park and Willow Ranch, Calif.; Prineville, Beatty, Klamath Falls, and Redmond, Oreg.; and Northport, Wash. The hosts cited are *Juniperus occidentalis* Hook. or *Juniperus* sp.

PHLOEOSINUS SERRATUS (LeConte)

Hylesinus serratus LeConte, Trans. Amer. Ent. Soc., vol. 2, p. 170, 1868.

Phloeosinus serratus LeConte, Proc. Amer. Philos. Soc., vol. 15, p. 381, 1876.—Schwarz, Ent. Amer., vol. 2, p. 56, 1886; Proc. Ent. Soc. Washington, vol. 1, p. 176, 1889.—Blandford, Biol. Centr.-Amer., Coleop., vol. 4, pt. 6, p. 160,

1897.—SMITH, Catalogue of the insects of New Jersey, p. 365, 1900.—FALL and COCKERELL, Trans. Amer. Ent. Soc., vol. 33, p. 218, 1900.—SWAINE, New York State Mus. Bull. 134, p. 130, 1909; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 70, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North Amer., pp. 170, 171, 1939.

Male (type).—Black, with elytra dark piceous brown; 3.74 mm. long, about 2.05 times as long as wide (but type specimen distorted from old pinning).

Frons rather wide between eyes; surface piceous, closely, sublongitudinally rugose-granulate at sides and above; rather weakly, transversely concave (or broadly transversely impressed), with a rather distinct elevated median carina. Eye about three times as long as wide, more than half divided by a V-shaped emargination. Antenna elongate, yellowish brown, sericeous, about twice as long as wide, with all sutures oblique.

Pronotum widest behind middle, sides arcuate, subinflated behind, strongly constricted just behind the broadly rounded anterior margin, and distinctly impressed across dorsum; surface piceous black, moderately shining, deeply, very closely, moderately coarsely punctured, more finely and densely in front; median line indistinct, with punctures as on rest of disk; lateral calli small; vestiture inconspicuous.

Elytra wider than pronotum, about 1.32 times as long as wide; sides subparallel, broadly rounded behind; surface shining, piceous brown, striae of moderate width, deep, with moderate-sized punctures; interspaces moderately wide, rugose-granulate-punctate with moderately short, decumbent, testaceous hairs. Declivity with first interspace convex, with large, black, closely placed serrations on lateral half, surface punctured, rugose; second interspace narrowed posteriorly, shining, nearly flat, closely, rugosely punctate, with a single tubercle near apex; third interspace elevated, with a row of black serrations slightly smaller than in first; fifth, seventh, and ninth interspaces each with a few serrations; vestiture consisting of hairs and rather narrow scales, neither very numerous.

The foregoing description was made from the unique type in the LeConte collection, Museum of Comparative Zoology, Harvard University, partly from my own notes made about 10 years ago and in part from notes recently made by P. J. Darlington, Jr., in comparing specimens sent to him with the type of *Phloeosinus serratus*.

In his original mention of the species LeConte records it from New York. The only locality label on the specimen is a pink disk indicating that it came from the "Middle States." Although much collecting has been done in this area since the time of LeConte, no specimen at all closely related to *serratus* has ever been taken. How-

ever, in the Southwestern and the Pacific States several closely related species such as *utahensis* Swaine, *aciculatus* Bruck, and *juniperi* Swaine are known to occur. None of these, however, agrees with *serratus*, but aside from its smaller size *utahensis* approaches it most closely. It seems likely that *serratus* will be found in the Southwestern States.

PHLOEOSINUS UTAHENSIS Swaine

Phloeosinus utahensis SWAINE, Can. Ent., vol. 47, p. 363, 1915; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, p. 68, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 175, 1939.

Male.—Black, with elytra reddish brown to piceous brown; 2.3–3.3 mm. long, nearly exactly twice as long as wide.

Frons moderately wide between the eyes, frontal rectangle about 0.68 as long as wide, epistomal lobe nearly lacking; surface black, shining, coarsely rugose-granulate-punctate, densely at sides and below; with a rather wide, moderately deep, arcuate, transverse impression; with a rather faint median carina on lower half, often interrupted by granules below; hairs fine and short. Eye about three times as long as wide, more than half divided by a rather narrow emargination. Antenna with club less than twice as long as wide, all of sutures distinctly oblique.

Pronotum about 1.16 times as wide as long, widest at posterior angles; sides regularly, arcuately convergent from base to lateral constriction just behind broad anterior margin, distinctly impressed across dorsum; surface piceous, brightly shining, moderately coarsely, rather closely and deeply punctured, subgranulately punctured at sides; median line very feebly elevated behind, punctured as rest of disk; lateral calli small; hairs fine and short.

Elytra distinctly wider than pronotum, about 1.33 times as long as wide, slightly widest just behind middle; sides feebly arcuate, subparallel on anterior two-thirds, semicircularly rounded behind; surface moderately shining; striae rather narrow, rather deeply impressed, with small but distinct, rather close punctures; interspaces wide, weakly convex, densely granulate-punctate and asperate on anterior disk, most of asperities and granules lacking on posterior disk, asperities becoming uniseriate on sides behind; disk and sides with rather numerous, fine, short hairs on interspaces. Declivity with first interspace convex, with mesal half finely, closely punctured, lateral half with a row of sparse, coarse, black serrations; second interspace wide, weakly convex, finely punctured, not serrate, but usually with a single tooth near extreme end; third interspace strongly elevated, with rather numerous, black, moderately coarse serrations and fine punctures; fifth, seventh, and ninth interspaces

each with a row of small serrations; entire declivity clothed with numerous, short, moderately stout hairs. Anterior face of mesosternum rather steep.

Female.—Similar to male in habitus; frons very wide between eyes, frontal rectangle about 0.64 as long as wide, convex, with a small subcircular or slightly curved, polished impression in median line, with a very fine, elevated, often indistinct median carina on lower half; elytral interspaces densely granulate-punctate and asperate, with asperities persistent throughout and becoming uniseriate on posterior half of disk; elytral declivity with first and third interspaces subequally, strongly convex, with rather small serrations, second interspace convex, finely and closely punctured, with a row of sparse, small teeth; with small asperities on the more lateral interspaces; entire declivity clothed with numerous, flat, scalelike hairs and a few slender, erect hairs from bases of asperities and serrations.

The species was described from 2 specimens from Stockton, Utah. The writer has studied more than 40 specimens from Utah, Arizona, and New Mexico. The hosts are *Juniperus pachyphloea* Torr. and *J. utahensis* (Engelm.) Lemmon.

PHLOEOSINUS ACICULATUS Bruck

Phocosinus aciculatus BRUCK, Pan-Pacific Ent., vol. 7, p. 127, 1931.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 174, 1939.

Male.—Piceous black, with elytra reddish brown to piceous brown; 2.0–3.0 mm. long, about 1.95 times as long as wide; closely allied to *utahensis* Swaine.

Frons very wide between eyes, frontal rectangle about 0.62 as long as wide, epistomal lobe very short; surface brightly shining, broadly, rather shallowly, transversely impressed, somewhat deeper and impunctate in median line, median carina weakly elevated on lower half, often nearly lacking, strongest in transverse impression, often interrupted by granules on epistoma; surface strongly, densely granulate-punctate; hairs fine and short, with those on epistomal margin longer. Eye three times as long as wide, nearly half divided by a sharp V-shaped emargination. Antenna with club nearly twice as long as wide, all sutures oblique.

Pronotum about 1.20 times as wide as long, widest at posterior angles; sides regularly arcuate and convergent from base to lateral constriction just behind very broad anterior margin, distinctly impressed across dorsum; surface brightly shining, finely, deeply, and moderately closely punctured (not so closely as in *serratus*), more finely and closely in front, sides subgranulately punctured; median line only feebly elevated on posterior third, more distinctly elevated

and impunctate in middle third; lateral calli of moderate size; hairs fine, short, and inconspicuous.

Elytra notably wider than pronotum, about 1.27 times as long as wide; sides subparallel on anterior two-thirds, broadly rounded behind; surface shining; striae narrow and moderately impressed (slightly wider and less deep than in *utahensis*), strial punctures moderately small (coarser than in *utahensis*), separated by their own diameters; interspaces wide, convex, densely granulate-punctate, granules mostly small and confused on anterior disk, posterior disk with a uniseriate row of small, sharp, toothlike asperities in each interspace; lateral interspaces with uniseriate asperities only on and near declivity, finely, confusedly granulate-punctate anteriorly; disk and sides with moderately numerous, short, moderately stout, yellowish hairs. Declivity with first interspace convex, mesal portion closely, finely punctured, with a row of coarse, black serrations on lateral half; second interspace wide, feebly convex, finely punctured, not serrate, with one or two teeth near apex; third interspace strongly elevated, with a row of moderately coarse, black serrations; more lateral interspaces each with a few smaller serrations; entire declivity with fairly numerous, short, rather stout, yellowish hairs. Mesosternum oblique in front.

Female.—Similar to male in habitus; frons very wide between eyes, frontal rectangle about 0.60 as long as wide, convex, densely, strongly granulate-punctate, scarcely impressed, with median carina very indistinct or lacking; elytral interspaces densely, finely granulate-punctate, with more numerous and stronger asperities than in male, becoming uniseriate midway on disk; declivity with all of interspaces serrate, those of second interspace but little smaller than those of first and third; entire declivity moderately clothed with flat, scale-like hairs, with a few slender, erect setae from bases of serrations.

Phloeosinus aciculatus was described from specimens "probably from juniper" collected in the Chiricahua Mountains, Cochise County, Ariz. The writer has studied more than 75 specimens collected at Sycamore Springs and Santa Catalina Mountains, Ariz.; Capitan Mountains, N. Mex.; and Davis Mountains, Tex. The hosts were *Juniperus pachyphloea* Torrey and *J. mexicana* Spreng.

PHLOEOSINUS NEOMEXICANUS, new species

PLATE 41, FIGURE 26

Male.—Black with the elytra reddish brown to piceous brown; 3.0 to 3.75 mm. long, holotype 3.46 mm. long, about 2.03 times as long as wide, allied to *juniperi* Swaine, but without granules in second declivital interspace.

Frons wide between eyes, frontal rectangle about 0.65 as long as wide, epistomal lobe very short, nearly lacking; surface black, feebly shining, moderately coarsely granulate-punctate; shallowly, rather broadly, arcuately impressed between eyes (subconcave in type), with a distinct, elevated median carina on lower half; hairs moderately fine and short. Eye nearly three times as long as wide, more than half divided by a rather narrow emargination. Antenna with club more than twice as long as wide, sutures all rather strongly oblique.

Pronotum about 1.17 times as wide as long, widest near posterior angles; sides distinctly arcuate and slightly convergent on posterior half, then more sharply narrowed, constricted just behind the moderately broadly rounded front margin, impressed across dorsum; surface black, shining, with deep, close punctures, moderately large (slightly coarser than in *juniperi*), finer and closer in front, more shallow and sub-granulate at sides; median line slightly elevated, usually impunctate behind, extending from base to transverse impression, widest in middle third; lateral calli moderately large; hairs longer, coarser, and more conspicuous than in *juniperi*, longer at sides.

Elytra wider than pronotum, about 1.30 times as long as wide, widest just in front of middle; sides subparallel, feebly arcuate on anterior two-thirds, broadly rounded behind; surface piceous brown, shining; striae narrow (distinctly narrower than in *juniperi*), strongly impressed, with punctures small and moderately spaced; interspaces several times as wide as striae, rather weakly convex, densely, confusedly granulate-punctate, with granules showing little tendency to uniseriate arrangement in anterior three-fourths of disk; hairs moderately fine and short (longer and more conspicuous than in *juniperi*). Declivity (pl. 41, fig. 26) with first interspace elevated, with large black serrations, some obsolete, mesal part of interspace finely, closely, roughly punctured; second interspace as wide as others, flat, devoid of serrations, finely, roughly punctured; third interspace elevated, with coarse, black serrations and with fine punctures each side of row of serrations; with a few smaller serrations on the more lateral interspaces; all declivital interspaces with numerous, moderately short, rather stout, yellow hairs (much more abundant, longer, and stouter than in *juniperi*). Anterior face of mesosternum oblique.

Female.—Similar to male in habitus; frons very wide between eyes, frontal rectangle about 0.60 as long as wide, convex, densely granulate-punctate, with rather faint arcuate transverse impression, median carina moderately developed on lower half; elytral declivity with first and third interspaces elevated, bearing smaller serrations than in male, second interspace flat, closely punctured, devoid of ser-

rations, all interspaces clothed with abundant hairs, of which those in first three interspaces are mostly scalelike.

Type locality.—Vermejo, N. Mex.

Additional localities.—Capitan, N. Mex.; Fort Garland, Colo.; and Panguitch, Utah.

Host.—*Juniperus scopulorum* Sargent.

Additional hosts.—*Juniperus monosperma* (Engel.) Sargent and *J. pachyphloea* Torrey.

Type material.—Holotype, allotype, and 35 paratypes, U.S.N.M. No. 55412.

Remarks.—The holotype, allotype, and 15 paratypes were taken from Rocky Mountain red cedar at Vermejo, N. Mex., by Hopkins; 10 paratypes from *J. monosperma* at Capitan, N. Mex., by W. F. Fiske; 7 paratypes from *Juniperus* at Fort Garland, Colo., by Hopkins; 3 paratypes from *Juniperus* at Panguitch, Utah, by H. E. Burke. Additional specimens have recently been collected by R. L. Furniss from *J. scopulorum*, *J. utahensis*, and *J. pachyphloea* in New Mexico, Utah, and Arizona.

PHLOEOSINUS TEXANUS, new species

Male.—Black, with elytra reddish brown to piceous; 2.15–3.14 mm. long, holotype 2.74 mm. long, 1.96 times as long as wide; allied to *neomexicanus*.

Frons very wide between eyes, frontal rectangle about 0.62 as long as wide, epistomal lobe not projecting beyond epistomal lip; surface black, shining, strongly granulate-punctate below and at sides, granules lacking in median area above; arcuately, transversely impressed, deeper in median line; median carina indistinct, often lacking except for small median tubercle on epistoma; hairs moderately short and fine. Eye three times as long as wide, more than half divided by a rather wide U-shaped emargination. Antenna with club nearly twice as long as wide; first suture arcuate, slightly oblique, others strongly oblique.

Pronotum about 1.14 times as wide as long, widest at posterior angles; sides arcuately convergent from base to constriction just behind broadly rounded front margin; surface black, shining, with deep, close, rather fine punctures (finer than in *neomexicanus*), finer and very dense near front margin, subgranulate on sides; median line slightly elevated on posterior two-thirds, impunctate and widest in middle third, lateral calli moderately small (smaller but more distinct than in *neomexicanus*); hairs more numerous than in *neomexicanus*, somewhat longer at sides.

Elytra wider than pronotum, about 1.28 times as wide as long; sides nearly straight and subparallel on anterior two-thirds, broadly

rounded behind; surface piceous brown, shining; striae narrow and strongly impressed (narrower than in *neomexicanus*), punctures very small, rather close, indistinctly seen; interspaces very wide (wider than in *neomexicanus*), moderately convex, confusedly granulate-punctate on disk, lateral interspaces with granules greatly reduced except on anterior third; hairs moderately numerous, rather fine and short. Declivity with first interspace moderately convex (less so than in *neomexicanus*), with moderately large, black serrations, some of them obsolete, finely, roughly punctured; second interspace wide, nearly flat, with serrations entirely lacking, finely, roughly punctured; third interspace elevated, with a rather sparse row of moderately large serrations; fifth, seventh, and ninth interspaces each with a few small serrations; entire declivity clothed with numerous short hairs (more numerous and not so stout as in *neomexicanus*). Anterior face of mesosternum oblique.

Female.—Similar to male in habitus, frons very wide between eyes, frontal rectangle about 0.58 as long as wide, convex, granulate-punctate below and at sides, punctured above, transverse impression faint, median carina very feebly developed on lower half; elytral declivity with first and third interspaces moderately elevated, finely punctured, serrations small and rather sparse; second interspace as wide as others, flat, finely, moderately closely punctured, entirely devoid of serrations; declivity clothed with numerous short, scalelike hairs, and a few fine, erect hairs.

Type locality.—Montell, Uvalde County, Tex.

Additional localities.—Sonora and Gillespie Counties, Tex.

Host.—*Juniperus mexicana* Spreng.

Type material.—Holotype, allotype, and 48 paratypes, U.S.N.M. No. 55413.

Remarks.—The holotype, allotype, and 35 paratypes were bred from *Juniperus mexicana* by W. F. Fiske at Montell, Tex.; 4 paratypes from "arborvitae" by O. G. Babcock at Sonora, Tex.; 4 paratypes marked "Tex., Collection of C. V. Riley"; 5 paratypes taken from "juniper" by J. N. Knull, Gillespie County, Tex.

PHLOEOSINUS CANADENSIS Swaine

Phloeosinus canadensis SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 1, p. 8, 1917; Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 2, pp. 68, 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 171, 1939.

Male.—Piceous, with elytra reddish brown to piceous; 2.14–2.85 mm. long, almost exactly twice as long as wide.

Frons wide between eyes, frontal rectangle about 0.70 as long as wide; epistomal lobe short, but evident; surface piceous black, shin-

ing, finely, closely granulate-punctate below and at sides, less finely, more deeply punctated above in median third, with interstices smooth; broadly, transversely impressed, sometimes subconcave, with a rather broad, elevated median carina bisecting concavity and extending to epistomal margin; hairs short and fine. Eye three times as long as wide, more than half divided by a U-shaped emargination. Antenna with club two-thirds longer than wide, first and second sutures subtransverse, third oblique.

Pronotum about 1.12 times as wide as long, widest behind; sides on posterior two-thirds gradually, arcuately narrowed, rather strongly constricted just behind the very broadly rounded anterior margin; surface piceous black, shining, distinctly impressed anteriorly between lateral constrictions; punctures deep, moderate in size and spacing, interstices smooth on disk, subgranulate at sides; median line behind slightly elevated, impunctate only near middle of disk; lateral calli small, only feebly elevated; vestiture fine and short but visible, slightly longer on sides.

Elytra wider than pronotum, about 1.29 times as long as wide, slightly wider behind middle; sides very feebly arcuate on anterior two-thirds, rather broadly rounded behind; surface shining; striae on disk narrow, deeply impressed, punctures fine and rather indistinct, striae slightly wider on sides; interspaces on disk wide (slightly less so than in *dentatus* (Say), slightly convex, not so wide and more strongly convex on sides, rather coarsely granulate (more coarsely and sparsely granulate than in *dentatus*), with coarser granules becoming uniseriate near declivity; hairs fairly numerous, fine, moderately short. Declivity with first and third interspaces rather strongly convex, each with a row of strong, sharp serrations, those on first interspace sparser than on third, densely, finely punctured on mesal portion; second interspace shining, unarmed, scarcely narrower than third, flat, sparsely, finely punctured; with a few sharp granules on the interspaces laterad of third; hairs longer and more conspicuous than on disk. Anterior face of mesosternum precipitous.

Female.—Similar to male, but frons wider between eyes, frontal rectangle about 0.63 as long as wide, convex, flattened and impressed between eyes, with a fine, weakly elevated median carina; elytral declivity with first and third interspaces less convex than in male, each with a row of sparse, small, sharp serrations; second interspace flat, unarmed, slightly narrower than third at apex; pubescence of disk and declivity more abundant than in male.

Phloeosinus canadensis was described from specimens taken from *Thuja occidentalis* L. in Quebec. It occurs throughout eastern Canada and the northeastern part of the United States from Maine to

the Lake States. The host trees are *T. occidentalis*, *Juniperus virginiana* L., and *Chamaecyparis thyoides* (L.) B. S. and P.

PHLOEOSINUS SCOPULORUM Swaine

Phloeosinus scopulorum SWAINE, Can. Ent., vol. 56, p. 148, 1924.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 179, 1939.

Male.—Black, with elytra reddish brown to piceous brown; 2.4–2.8 mm. long, about 2.04 times as long as wide; allied to *canadensis*.

Frons wide between eyes, frontal rectangle about 0.66 as long as wide, epistomal lobe short; surface black, shining, moderately finely, closely granulate-punctate at sides and below, punctate above in median area, with interstices smooth; broadly, arcuately, transversely impressed, with medium portion deeper (subconcave), with a distinct, moderately elevated median carina on lower half; hairs short and fine. Eye about three times as long as wide, about half divided by a U-shaped emargination. Antenna about twice as long as wide, all of the sutures oblique.

Pronotum about 1.17 times as wide as long, widest near posterior angles; sides arcuate on posterior two-thirds, rather strongly constricted just behind broadly rounded anterior margin; surface piceous black, shining; punctures of disk deep, moderately close, of medium size, finer and denser in front, close and subgranulate at sides; median line slightly elevated and impunctate from base to transverse impression; lateral calli large; vestiture of fine, short hairs on disk, slightly longer on sides.

Elytra wider than pronotum, about 1.30 times as long as wide, widest through basal serrations; sides subparallel on basal two-thirds, moderately broadly rounded behind; surface shining; striae impressed, narrow, punctures moderately fine, usually distinct; striae wider and punctures larger on sides; interspaces on disk feebly convex, confusedly granulate on anterior half, becoming uniseriate on first and third interspaces behind, obsolescent on second and fourth behind; lateral interspaces scarcely granulate, feebly so behind, hairs rather short and fine, moderately sparse. Declivity with first and third interspaces elevated, each with a row of moderately large black serrations; first interspace finely, closely punctured on mesal half; second interspace flat, not narrowed, with rather fine, moderately close, obsolescent punctures, devoid of serrations; lateral interspaces of declivity with a few small, sharp granules; vestiture with longer slender hairs from serrations and more numerous shorter ones. Anterior face of mesosternum rather precipitous.

Female.—Similar to male, frons wider between eyes, frontal rectangle about 0.64 as long as wide, convex, closely, finely granulate-punctate at sides and below, punctured above, very faintly impressed

between eyes, median carina represented by a small tubercle at epistomal margin; elytral declivity similar to that of male but with smaller serrations on interspaces 1 and 3, second interspace not narrowed at apex, entirely without serrations, but rather closely, strongly punctured; vestiture more abundant than in male, with many hairs flattened and somewhat scalelike.

This species is closely allied to *canadensis* but differs in that all sutures of the antennal club are oblique and the median line and lateral calli of the pronotum are more strongly developed. The female differs from that of *canadensis* in having the second declivital interspace wide to the apex and in having more abundant, scalelike hairs on the declivity.

Phloeosinus scopulorum Swaine was described from specimens taken from *Juniperus scopulorum* Sargent at Williams Lake, British Columbia.

Through the courtesy of W. J. Chamberlin, of Corvallis, Oreg., the writer has studied a female paratype in the preparation of the description. Two additional specimens, a male and a female taken from *J. scopulorum* at Vantage Bridge, Wash., by J. A. Beal and F. P. Keen, were studied carefully and are the only other specimens seen.

PHLOEOSINUS TACUBAYAE Hopkins

Phloeosinus tacubayae HOPKINS, Proc. Ent. Soc. Washington, vol. 7, p. 78, 1905.—
SCHEDL, Anal. Escuela Nac. Cienc. Biol., vol. 1, p. 337, 1940.

Male.—Black, the elytra reddish brown to piceous brown; 2.0 to 2.51 mm. long, about 2.0 times as long as wide; allied to *canadensis*.

Frons moderately wide between eyes, frontal rectangle about 0.78 as long as wide, epistomal lobe short; surface black, shining, finely, closely granulate-punctate below and at sides, roughly punctured above in median area, broadly arcuately, transversely impressed, with an elevated median carina on lower half; hairs moderately short and fine. Eye three times as long as wide, more than half divided by a rather wide emargination. Antenna with club less than half as wide as long, all of sutures oblique.

Pronotum about 1.22 times as wide as long, widest behind; sides straight and subparallel on posterior third, then strongly, arcuately narrowed to the lateral constriction just behind very broadly rounded front margin; surface black, broadly, transversely impressed on anterior third; disk shining, smooth, with deep, close, moderate-sized punctures, finer and denser near anterior margin, closely, roughly, subgranulately punctured at sides; median line feebly elevated behind, punctured throughout; lateral calli lacking or nearly so; vestiture of short, fine hairs on disk, slightly longer in transverse impression, much longer on sides.

Elytra wider than pronotum, about 1.34 times as long as wide; sides subparallel, very feebly sinuate, on anterior two-thirds, broadly rounded behind; surface moderately shining; striae on disk narrow, rather strongly impressed, punctures fine, elongate, rather close; striae on sides, slightly wider, shallower, with somewhat larger punctures; interspaces wide and flat, finely, densely, confusedly granulate-punctate, tending to become uniseriate behind; lateral interspaces narrower, slightly convex; vestiture consisting of short, rather numerous hairs, slender and rather sparse on anterior half, becoming more abundant and stouter behind. Declivity with first and third interspaces moderately convex, each with a row of rather small, granulelike serrations, very finely and closely punctured; second interspace nearly flat, nearly as wide as others, closely, finely punctured, devoid of serrations; interspaces laterad of fourth all finely serrate and punctate; all interspaces with rather abundant, small, more or less scalelike hairs and with a few slender hairs. Anterior face of mesosternum moderately precipitous.

Female.—Similar to male in general habitus, with frons wider between eyes, frontal rectangle about 0.71 as long as wide, convex, feebly impressed in median area, finely, densely granulate-punctate, with a fine, rather indistinct median carina on lower half; elytral declivity similar to that of male but with smaller serrations on first and third interspaces; second interspace punctured and without serrations as in male; vestiture consisting of a few slender hairs and many flattened, widened, scalelike hairs.

Type locality.—Tacubaya, D. F., Mexico.

Host.—*Cupressus*.

Type material.—Female type and five paratypes, U.S.N.M. No. 7516.

Remarks.—The female type and five paratypes (male type apparently lost) were taken from *Cupressus* at Tacubaya, D. F., Mexico, by E. Bowmann, February 1903. In addition nine specimens taken from *Cupressus benthami* Endl. at Chapultepec August 1927, and nine specimens collected from *Cupressus* near pyramids of San Juan, Teotihuacan, Mexico, by D. DeLeon were studied by the writer.

PHLOEOSINUS RUGOSUS Swaine

Phloeosinus rugosus SWAINE, Canada Dept. Agr., Ent. Branch, Bull. 14, pt. 1, pp. 9, 10, 1917; pt. 2, p. 69, 1918.—W. J. CHAMBERLIN, Bark and timber beetles of North America, p. 172, 1939.

Male.—Black, with the elytra dark piceous brown; 2.54 to 3.00 mm. long, about 2.07 times as long as wide.

Frons wide between eyes, frontal rectangle about 0.67 as long as wide, epistomal lobe moderately short; surface black, feebly shining to subopaque, granulate-punctate below and at sides, roughly

punctured above, broadly, arcuately impressed, varying to rather strongly concave between eyes, with a sharp, elevated median carina on lower half (also variable); hairs short and fine. Eye not quite three times as long as wide, about half divided by a moderately narrow, V-shaped emargination. Antenna with club twice as long as wide, all sutures oblique.

Pronotum about 1.2 times as wide as long, widest at posterior angles; sides very feebly, arcuately convergent on posterior half, then strongly, arcuately narrowed to lateral constriction just behind broadly rounded front margin, distinctly impressed across dorsum; surface black, shining, with deep, moderately large, moderately close punctures, much finer and closer in front, sides punctured, not granulate; median line very feebly elevated on posterior fourth, middle half with an approximate double line of smaller, more closely placed punctures; lateral calli very feebly indicated or entirely absent; hairs short and fine, slightly longer at sides.

Elytra slightly wider than pronotum, about 1.37 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface piceous brown, moderately shining; striae rather narrow, moderately strongly impressed, with moderately small, shallow, rather closely placed, indistinct punctures; interspaces rather wide on disk, convex, first two widened near base, rather coarsely granulate-punctate, rugose on anterior third, granules tending to become fewer and uniseriate near declivity; vestiture short and scanty, but becoming more abundant near declivity. Declivity finely, closely, and roughly punctured, with rather abundant, short, slender hairs; striae narrow, distinctly impressed; first and third interspaces each with a row of moderate-sized serrations, those of first slightly larger and becoming obsolescent on apical third; second interspace nearly flat, shining, with fine, moderately close punctures, devoid of serrations. Anterior face of mesosternum slightly oblique.

Female.—Similar to male in habitus, frons very wide between eyes, frontal rectangle about 0.65 as long as wide, convex, strongly granulate-punctate, rather indefinitely, transversely impressed, with a very fine, elevated median carina; elytral declivity similar to that of male but with the serrations somewhat smaller, and the vestiture consisting of a few slender hairs from bases of serrations and numerous small, flat, scalelike hairs.

The type series was collected from juniper, Scaffold Meadow, Tulare County, Calif., by Hopping. The specimens before me include two specimens with identical data and probably from the same field lot; specimens taken from *Juniperus occidentalis* Hook., by Miller, Sequoia National Forest; from same host at Willow Ranch, Calif., by J. A. Beal; and from Alturas and Devils Garden, Calif., by E. F. Wohletz.

PHLOEOSINUS FURNISSI, new species

PLATE 41, FIGURES 27, 28

Male.—Black, with elytra piceous brown at base, shading to reddish on declivity; 2.28 to 3.34 mm. long, holotype 2.68 mm. long, about 2.14 times as long as wide.

Frons (pl. 41, fig. 28) very wide between eyes, frontal rectangle about 0.63 as long as wide; epistomal lobe rather short; surface black, moderately shining, finely and densely granulate-punctate at sides, finely, closely punctate above; central area deeply concave, with concavity subtriangular, broad below, narrower above and extending to level of upper border of eyes, shining and impunctate in center, median carina short and obscure on lower fourth, with a small, rather obscure callus at each side on ventrolateral rim of concavity; hairs at sides and above concavity fine, moderately short, inconspicuous. Eye more than three times as long as wide, more than half divided by an emargination. Antenna with club about 2.18 times as long as wide, first and second sutures distinctly oblique, third suture very strongly oblique, sinuate.

Pronotum about 1.14 times as wide as long, widest on posterior half; hind angles rounded, sides nearly straight, weakly arcuate on posterior half, then arcuately narrowed to the constriction just behind the broadly rounded anterior margin; surface shining, black, transversely impressed anteriorly; disk very deeply, closely, moderately finely punctured, not granulate, finer and closer in front, sides slightly roughened but not granulate; median line not elevated, not usually impressed at each side behind, marked by finer, closer punctures; lateral calli absent or only feebly developed; pubescence fine, rather short, visible, but not conspicuous, somewhat longer just anterior to position of lateral calli.

Elytra slightly wider than pronotum, about 1.35 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, broadly rounded behind; surface shining, shading from piceous brown near base to reddish brown on declivity; striae, except the first one, which is wider, less than half as wide as interspaces, deeply impressed, stria punctures shallow, rather small, moderately close on disk, somewhat larger and more distinct on sides, with striae shallower; interspaces convex, granulate-punctate, with granules becoming uniseriate on posterior disk, with hairs moderately short and fine and moderately conspicuous. Declivity with first and third interspaces strongly convex, the first closely, finely punctured, with a row of coarse, closely placed, black, recurved serrations; third interspace more strongly convex, with slightly smaller, very closely placed serrations, often somewhat irregular owing to crowding, and occasionally so crowded as to form a partially double row; fifth, seventh, and ninth

interspaces moderately convex, each with a few small to moderate serrations; second interspace flat, as wide as others, finely, rather closely, somewhat roughly punctured, devoid of granules and serrations; hairs short, stout, more abundant than on disk, not scalelike.

Anterior face of mesosternum moderately sloping.

Female.—Similar in habitus to male; frons (pl. 41, fig. 27) slightly shorter and wider, frontal rectangle about 0.61 as long as wide, granulate-punctate below, with a small, impunctate callus at each side, transversely, triangularly impressed, median carina very indistinct; elytral declivity with first and third interspaces rather strongly convex, the serrations much finer than in male, hairs more numerous and much stouter, many of them scalelike.

Type locality.—Flagstaff, Ariz.

Additional localities.—Nogal, N. Mex., Mesa Verde, Colo., Boulder and Manila, Utah, and Fort Bridger, Wyo.

Host.—*Juniperus pachyphloea* Torrey.

Additional hosts.—*Juniperus utahensis* (Engelm.) Lemmon and *J. monosperma* (Engelm.) Sargent.

Type material.—Holotype, allotype, and 101 paratypes, U.S.N.M. No. 55414.

Remarks.—The holotype, allotype, and 53 paratypes were taken from *Juniperus* at Flagstaff, Ariz., by R. L. Furniss; 7 paratypes from *J. pachyphloea*, Mesa Verde National Park, Colo., by M. W. Blackman; 6 paratypes from *Juniperus* sp., Mesa Verde National Park, Colo., by H. E. Burke, and paratypes were collected by R. L. Furniss as follows: 16 from *J. utahensis* at Boulder and Manila, Utah; 5 from the same host at Fort Bridger, Wyo., and 12 from *J. monosperma* at Nogal, N. Mex.

PHLOEOSINUS CHAMBERLINI, new species

Male.—Black, shining, with elytra ferruginous to piceous near base, reddish brown on declivity; 2.05 to 2.51 mm. long, holotype 2.31 mm. long, about 2.08 times as long as wide.

Frons very wide between eyes, frontal rectangle about 0.66 as long as wide; epistomal lobe short; surface black, shining, finely and densely granulate-punctate at sides, with deep, slightly coarser punctures, not granulate above; central area rather deeply and broadly concave, central two-fifths of concavity brightly shining, impunctate, with a fine, usually indistinct, short median carina on the lower half; hairs at sides and above concavity slightly coarser. Eye about three times as long as wide, more than half divided by a U-shaped emargination. Antenna with club about twice as long as wide, first and second sutures slightly oblique, third suture strongly oblique and sinuate.

Pronotum about 1.17 times as wide as long, widest in posterior third; sides feebly arcuate on posterior third, more strongly, arcuately narrowed on middle third, constricted just behind the broadly rounded anterior margin; surface black, shining, transversely impressed opposite anterior constriction; disk with very deep, rather close, moderate-sized punctures, slightly roughened (subgranulate) at sides; median line not elevated, more finely and closely punctured, indefinitely impressed at each side of middle on posterior third; lateral calli usually small; pubescence short and fine, distinctly longer just anterior to lateral calli.

Elytra slightly wider than pronotum, about 1.41 times as long as wide; sides nearly straight and subparallel on anterior two-thirds, moderately broadly rounded behind; surface shining; striae about half as wide as interspaces, rather strongly impressed, stria punctures close, of moderate size, rather shallow, similar on sides, considerably smaller on declivity; interspaces convex, confusedly granulate-asperate near base, rugose-punctate with occasional rounded granules in middle disk, becoming uniseriately asperate on first and alternate interspaces on posterior disk, pubescence short, fine, and inconspicuous on disk. Declivity with first, third, and alternate interspaces rather strongly convex, first and third closely, finely punctured, each with a uniseriate row of moderately small serrations; fifth and seventh interspaces with two to four similar serrations; ninth interspace joining third, distinctly, rather finely serrate; second interspace nearly flat, only slightly narrower than third, finely and moderately closely punctured, without serrations or granules; elytral pubescence consisting of short, fine hairs, none of them scalelike. Anterior face of mesosternum somewhat sloping.

Female.—Similar to male in size and proportions; frontal rectangle about 0.64 as long as wide, densely granulate-punctate, with a fine, elevated median carina on lower half; elytral declivity with serrations much smaller than in male, pubescence consisting of numerous short, flat, scalelike hairs.

Type locality.—Alturas, Calif.

Additional localities.—Prineville and Redmond, Oreg.

Host.—*Juniperus occidentalis* Hooker.

Type material.—Holotype, allotype, and 133 paratypes, U.S.N.M. No. 55415.

Remarks.—The holotype, allotype, and 40 paratypes were reared from small branches of *Juniperus occidentalis* taken at Alturas, Calif., by F. P. Keen; 40 paratypes were reared from limbs of *J. occidentalis* taken at Prineville, Oreg., by W. J. Buckhorn; and 53 paratypes from *J. occidentalis* at Redmond, Oreg., by W. J. Chamberlin. The species is named in honor of W. J. Chamberlin, Oregon State College, Corvallis, Oreg.

HOSTS AND DISTRIBUTION OF NORTH AMERICAN SPECIES OF PHLOEOSINUS CHAPUIS

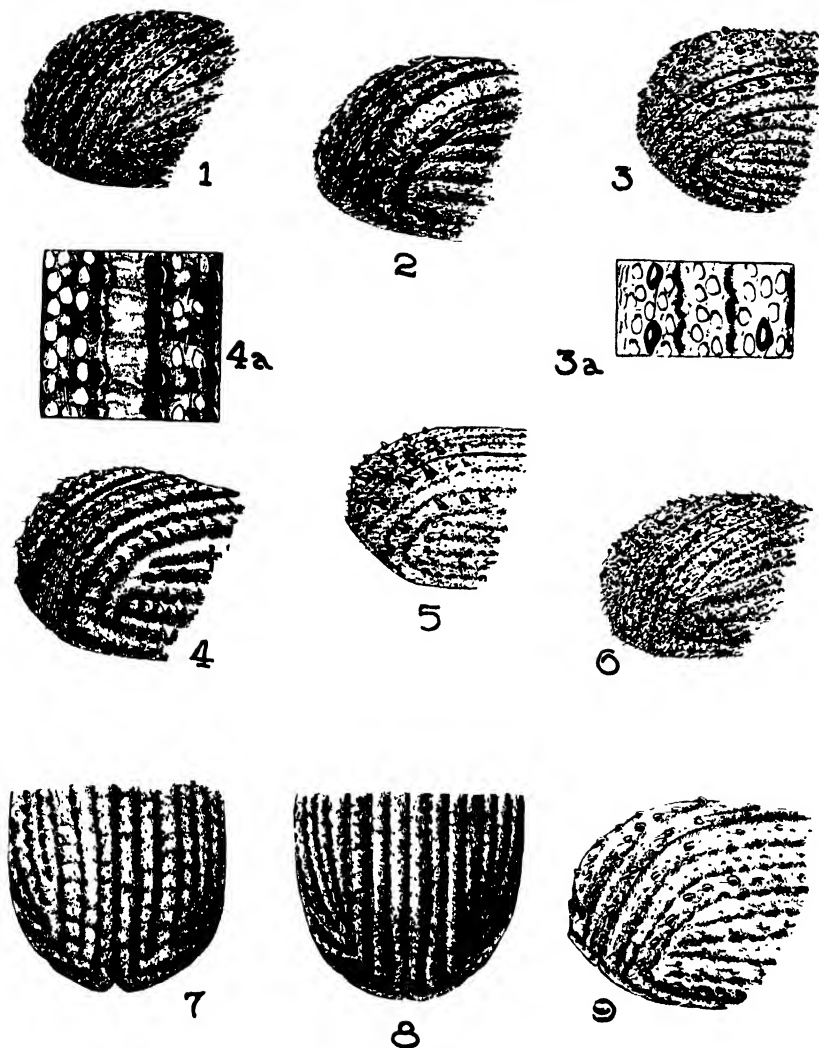
Species	Known distribution	Known hosts
<i>aciculatus</i> Bruck.....	Arizona, New Mexico, Texas.	<i>Juniperus pachyphloea</i> , <i>J. mexicana</i>
<i>alaskanus</i> , new species...	Alaska.....	<i>Picea canadensis</i>
<i>antennatus</i> Swaine.....	California, Oregon.....	<i>Libocedrus decurrens</i>
<i>arizonicus</i> , new species...	Arizona.....	<i>Cupressus arizonica</i>
<i>baumanni</i> Hopkins.....	Mexico, D. F.....	<i>Cupressus benthami</i>
<i>buckhorni</i> , new species...	Oregon.....	<i>Thuja plicata</i> , <i>Libocedrus decurrens</i>
<i>canadaensis</i> Swaine.....	Northeastern States, eastern Canada	<i>Thuja occidentalis</i> , <i>Juniperus virginiana</i> , <i>Chamaecyparis thyoides</i>
<i>chamobertini</i> , new species	California, Oregon.....	<i>Juniperus occidentalis</i>
<i>chiricahua</i> , new species...	Arizona, Mexico.....	<i>Cupressus arizonica</i> , <i>C. glabra</i> , <i>Juniperus pachyphloea</i>
<i>coronatus</i> Chapuis.....	Yucatan, Mexico.....	Unknown
<i>cristatus</i> (LeConte).....	California, Arizona.....	<i>Cupressus macrocarpa</i> , <i>C. glabra</i>
<i>cupressi</i> Hopkins.....	California.....	<i>Cupressus macrocarpa</i> , <i>Sequoia sempervirens</i>
<i>deleoni</i> , new species.....	Mexico.....	<i>Juniperus flaccida</i>
<i>dentatus</i> (Say).....	New Hampshire to Georgia and westward to Texas and Nebraska	<i>Juniperus virginiana</i> , <i>Chamaecyparis thyoides</i> , <i>Thuja occidentalis</i>
<i>frontalis</i> Bruck.....	California.....	<i>Cupressus arizonica</i>
<i>fulgens</i> Swaine.....	California, Oregon.....	<i>Libocedrus decurrens</i>
<i>furnissi</i> , new species...	Arizona, Colorado, New Mexico, Utah, Wyoming	<i>Juniperus pachyphloea</i> , <i>J. utahensis</i> , <i>J. monosperma</i>
<i>granulatus</i> Bruck.....	California.....	<i>Cupressus forbesii</i>
<i>hoferi</i> , new species.....	Colorado, New Mexico, Texas, Wyoming, Utah, Arizona	<i>Juniperus scopulorum</i> , <i>J. pachyphloea</i> , <i>J. utahensis</i>
<i>hoppingi</i> Swaine.....	California.....	<i>Libocedrus decurrens</i> , <i>Juniperus occidentalis</i> , <i>Cupressus macrocarpa</i>
<i>juniperi</i> Swaine.....	California, Oregon, Washington	<i>Juniperus occidentalis</i>
<i>kaniksu</i> , new species...	Washington, Idaho.....	<i>Thuja plicata</i>
<i>keeni</i> , new species.....	Washington.....	<i>Chamaecyparis nootkatensis</i>
<i>neomexicanus</i> , new species	New Mexico, Colorado, Utah, Arizona	<i>Juniperus pachyphloea</i> , <i>J. utahensis</i> , <i>J. scopulorum</i> , <i>J. monosperma</i>
<i>nitidus</i> Swaine.....	Oregon.....	<i>Chamaecyparis nootkatensis</i>
<i>piceae</i> Swaine.....	Quebec, Canada.....	<i>Picea canadensis</i>
<i>pini</i> Swaine.....	Manitoba, Canada; Michigan	<i>Pinus banksiana</i> , <i>P. strobi</i>
<i>punctatus</i> LeConte.....	Oregon, California, Washington	<i>Libocedrus decurrens</i> , <i>Thuja plicata</i> , <i>Juniperus occidentalis</i>

Species	Known distribution	Known hosts
<i>rubicundulus</i> Swaine	California	<i>Sequoia washingtoniana</i> , <i>Libocedrus decurrens</i>
<i>rugosus</i> Swaine	California	<i>Juniperus occidentalis</i>
<i>rusti</i> , new species	Washington	<i>Thuja plicata</i>
<i>scopulorum</i> Swaine	British Columbia, Canada; Washington	<i>Juniperus scopulorum</i>
<i>sequoiae</i> Hopkins	California, Oregon	<i>Sequoia sempervirens</i> , <i>Cupressus</i> sp.
<i>serratus</i> (LeConte)	?	Unknown
<i>scelosus</i> Bruck	California	<i>Cupressus sargentii</i> , <i>Libocedrus decurrens</i>
<i>spinosus</i> , new species	Arizona, New Mexico	<i>Cupressus arizonica</i>
<i>splendens</i> , new species	Oregon, California	<i>Libocedrus decurrens</i>
<i>squamosus</i> , new species	Washington	<i>Thuja plicata</i> , <i>Libocedrus decurrens</i>
<i>swainei</i> Bruck	California	<i>Cupressus sargentii</i>
<i>tacubayae</i> Hopkins	Mexico	<i>Cupressus benthami</i>
<i>tazodii</i> Blackman	Mississippi, Louisiana, Florida, North Carolina, South Carolina	<i>Taxodium distichum</i>
<i>texanus</i> , new species	Texas	<i>Juniperus mexicana</i>
<i>utahensis</i> Swaine	Utah, Arizona, New Mexico	<i>Juniperus pachyphloea</i> , <i>J. utahensis</i>
<i>vandykei</i> Swaine	California, Oregon	<i>Libocedrus decurrens</i> , <i>Thuja plicata</i>
<i>variolatus</i> Bruck	California	<i>Cupressus sargentii</i>

TREES KNOWN TO SERVE AS HOSTS FOR SPECIES OF *PHLOEOSINUS* CHAPUIS

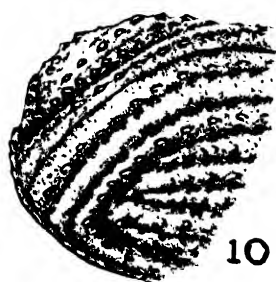
Host	Species
<i>Chamaecyparis nootkalensis</i> (Lambert) Sudw.	<i>keeni</i> , new species; <i>nitidus</i> Swaine
<i>Chamaecyparis thyoides</i> (L.) B. S. P.	<i>canadensis</i> Swaine; <i>dentatus</i> (Say)
<i>Cupressus arizonica</i> Greene	<i>arizonicus</i> , new species; <i>chiricahua</i> , new species; <i>frontalis</i> Bruck; <i>spinosus</i> , new species
<i>Cupressus benthami</i> Endl.	<i>baumanni</i> Hopkins; <i>tacubayae</i> Hopkins
<i>Cupressus forbesii</i> Jepson	<i>granulatus</i> Bruck
<i>Cupressus glabra</i> Sudw.	<i>chiricahua</i> , new species; <i>cristatus</i> (LeConte)
<i>Cupressus macrocarpa</i> Gordon	<i>cristatus</i> (LeConte); <i>cupressi</i> Hopkins; <i>hoppingi</i> Swaine
<i>Cupressus sargentii</i> Jepson	<i>scelosus</i> Bruck; <i>swainei</i> Bruck; <i>variolatus</i> Bruck
<i>Juniperus flaccida</i> Schlecht.	<i>deleoni</i> , new species
<i>Juniperus mexicana</i> Spreng.	<i>aciculatus</i> Bruck; <i>texanus</i> , new species
<i>Juniperus monosperma</i> (Engelm.) Sargent	<i>furnissi</i> , new species; <i>neomexicanus</i> , new species
<i>Juniperus occidentalis</i> Hook.	<i>chamberlini</i> , new species; <i>hoppingi</i> Swaine; <i>juniperi</i> Swaine; <i>punctatus</i> LeConte; <i>rugosus</i> Swaine

<i>Host</i>	<i>Species</i>
<i>Juniperus pachyphloea</i> Torrey.....	<i>aciculatus</i> Bruck; <i>chiricahua</i> , new species; <i>furnissi</i> , new species; <i>hoferi</i> , new species; <i>neomexicanus</i> , new species; <i>utahensis</i> Swaine
<i>Juniperus scopulorum</i> Sargent.....	<i>hoferi</i> , new species; <i>neomexicanus</i> , new species, <i>scopulorum</i> Swaine
<i>Juniperus utahensis</i> (Engelm.) Lemmon.	<i>furnissi</i> , new species; <i>hoferi</i> , new species; <i>neomexicanus</i> , new species; <i>utahensis</i> Swaine
<i>Juniperus virginiana</i> L.....	<i>canadensis</i> Swaine; <i>dentatus</i> (Say)
<i>Libocedrus decurrens</i> Torr.....	<i>antennatus</i> Swaine; <i>buckhorni</i> , new species; <i>fulgens</i> Swaine; <i>hoppingi</i> Swaine, <i>punctatus</i> LeConte; <i>rubicundulus</i> Swaine; <i>setosus</i> Bruck; <i>splendens</i> new species; <i>squamosus</i> , new species; <i>vandykei</i> Swaine
<i>Picea canadensis</i> (Mill.) B. S. P....	<i>alaskanus</i> , new species; <i>piceae</i> Swaine
<i>Pinus banksiana</i> Lambert.....	<i>pini</i> Swaine
<i>Pinus strobi</i> L.....	<i>pini</i> Swaine
<i>Sequoia sempervirens</i> (Lambert) Endl.	<i>cupressi</i> Hopkins; <i>sequoiae</i> Hopkins
<i>Sequoia washingtoniana</i> (Winsl.) Sudw.	<i>rubicundulus</i> Swaine
<i>Taxodium distichum</i> (L.) L. C. Rich.	<i>taxodii</i> Blackman
<i>Thuja occidentalis</i> L.....	<i>canadensis</i> Swaine; <i>dentatus</i> (Say)
<i>Thuja plicata</i> D. Don.....	<i>buckhorni</i> , new species; <i>kaniksu</i> , new species; <i>punctatus</i> LeConte; <i>rusti</i> , new species; <i>squamosus</i> , new species; <i>vandykei</i> Swaine



ELYTRAL DECLIVITY IN PHLOEOSINUS

1, *P. alaskanus*, new species, male; 2, *P. hoferi*, new species, male; 3, *P. frontalis* Bruck. male; 3a, same, details of first three interspaces; 4, *P. arizonicus*, new species, male; 4a, same, details of first three interspaces; 5, *P. spinosus*, new species, male; 6, *P. spinosus*, female; 7, *P. splendens*, new species, male; 8, *P. fulgens* Swaine, male; 9, *P. rubicundulus* Swaine, male.



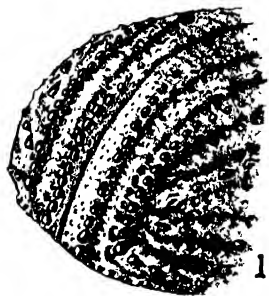
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13a



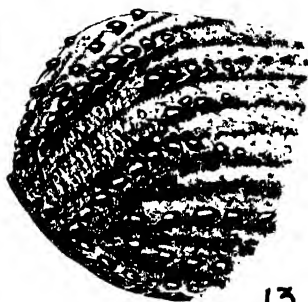
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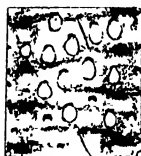
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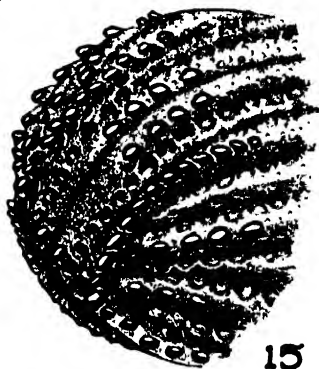
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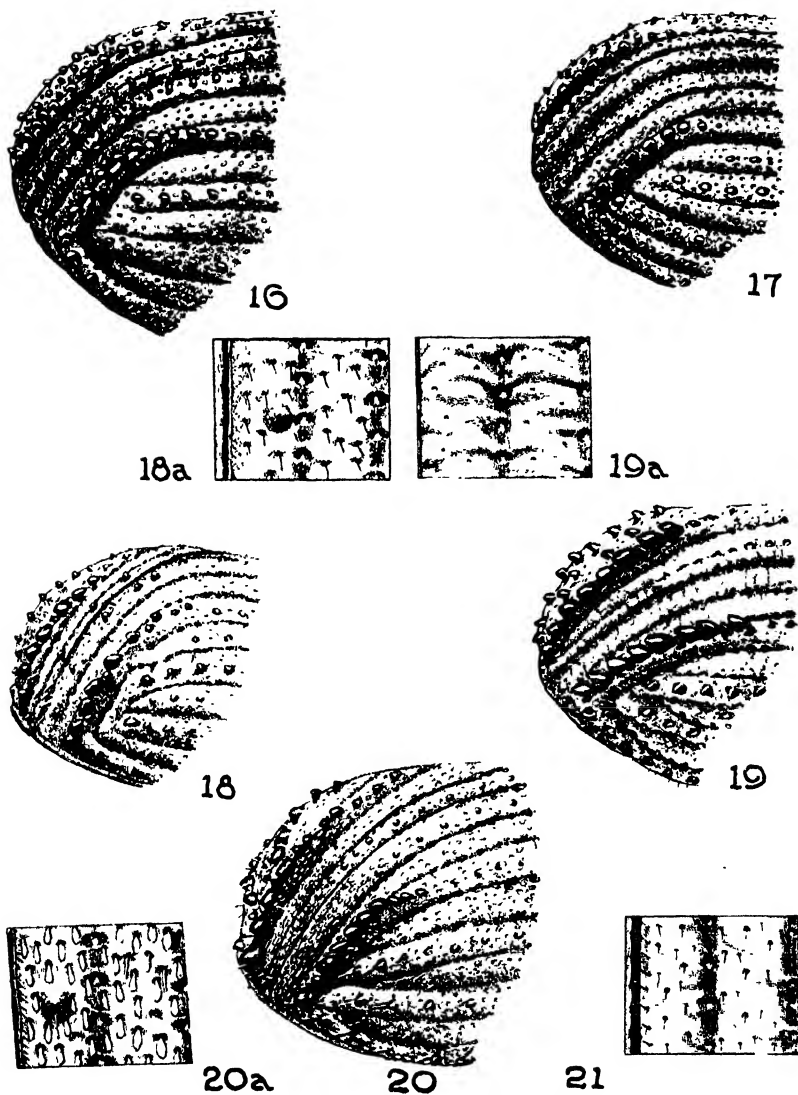
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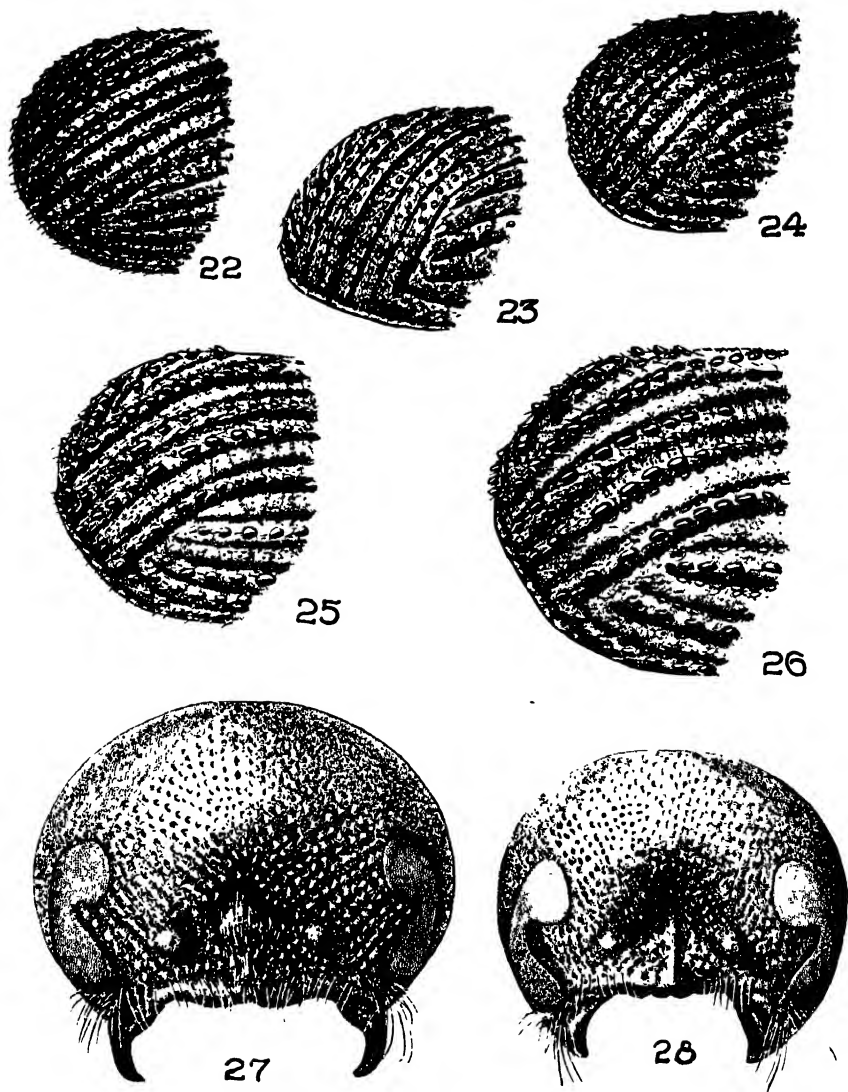
ELYTRAL DECLIVITY IN PHLOEOSINUS

10, *P. punctatus* LeConte, female; 11, *P. punctatus*, male; 12, *P. cupressi* Hopkins, female; 12a, same, details of first and second interspaces; 13, *P. cupressi*, male; 13a, same, details of first two interspaces; 14, *P. variolatus* Bruck, female; 14a, same, details of second interspace; 15, *P. variolatus*, male; 15a, same, details of first two interspaces.



ELYTRAL DECLIVITY IN PHLOEOSINUS

- 16, *P. cristatus* LeConte, female; 17, *P. cristatus*, male; 18, *P. sequoiae* Hopkins, female; 18a, same, details of first and second interspaces; 19, *P. sequoiae*, male; 19a, same, details of first two interspaces; 20, *P. squamosus*, new species, female; 20a, same, details of first two interspaces; 21, *P. squamosus*, male, details of first two interspaces.



ELYTRAL DECLIVITY AND FACE VIEWS OF PHLOEOSINUS

- 22, *P. taxodii* Blackman, male; 23, *P. taxodii*, female; 24, *P. dentatus* (Say), male; 25, *P. juniperi* Swaine, male; 26, *P. neomexicanus*, new species, male; 27, face view of *P. furnissi*, new species, female, with mandibles omitted; 28, face view of *P. furnissi* male, with mandibles omitted.



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THE LATE CENOZOIC VERTEBRATE FAUNAS FROM THE SAN PEDRO VALLEY, ARIZ.

By C. LEWIS GAZIN

THE COLLECTIONS of fossil vertebrate remains in the United States National Museum from deposits in the San Pedro Valley of southeastern Arizona have come to be of much significance in including materials representing appreciable portions of previously little-known microfaunas of upper Pliocene and early Pleistocene stages. The study of these materials, for the most part collected by J. W. Gidley, was undertaken by him but never completed. Important parts of the two principal collections were left undescribed, so that our knowledge of the faunas as a whole was dependent upon a somewhat inaccurate list, compiled before portions had been studied and before some portions were prepared. Hence, it has been found advisable to complete the undertaking by including in the present paper brief discussions of the elements of both the described and undescribed portions. Revision has been made of certain identifications and conclusions, where such changes are indicated by more recent information.

I wish to express my gratitude to the staff of the Division of Mammals of the United States National Museum, for permitting me unrestrained access to the collections of Recent mammals, and to C. W. Hibbard, of the University of Kansas, for information pertaining to materials from the upper Pliocene of Kansas and for the privilege of examining carnivore and rodent materials therefrom. The drawings depicting *Canis edwardii*, new species, *Spilogale pedroensis*, new species, and *Tanupolama cf. longurio* were made by Sydney Prentice. The others, except for a camera lucida drawing of *Sylvilagus? bensonensis*, new species, were made by Rudolf Weber.

PREVIOUS INVESTIGATIONS

A first systematic search of the fossiliferous deposits was made by Gidley early in 1921, when, in cooperation with the United States Geological Survey and in the company of Kirk Bryan, he examined and collected from localities discovered by Bryan the previous year. The expedition proved to be of marked success, resulting in a collection of materials that included specimens of exhibition value and a representation of faunas of considerable scientific interest, being the earliest to portray sizeable microfaunae of a relatively obscure portion of the Cenozoic.

A popular account of the expedition (Gidley, 1922a) appeared in a report on the Explorations and Field Work of the Smithsonian Institution in 1921. Gidley's preliminary report on the collection and detailed description of the rodents and lagomorphs were published by the United States Geological Survey in 1922, and in 1926 his report of the Proboscidea and Edentata appeared. C. W. Gilmore, in 1922, described a new turtle from the Benson occurrence, and in 1928 and 1938 included statements on the lizard and snake remains from the Benson and Curtis Ranch localities, respectively, in his monographs on these groups. Remains of the rather large avifauna, principally from Benson, were studied by Alexander Wetmore (1924).

The two faunas as a whole, or in part, have been the subject of much discussion in subsequent writings, including those of Hay (1927), Osborn (1936), J. R. Schultz (1937), and Wilson (1937); and new forms were added to the faunas by Frick (1937), Stirton (1931), and A. E. Wood (1935).

On a second trip to the San Pedro Valley in 1924 Gidley made a collection from the Benson and Curtis ranch localities for the American Museum under a grant from Childs Frick. The materials in this collection, except for the heteromyid rodents examined by Wood, have not been described. Additional collecting in these beds has been done by parties for Mr. Frick, and the horned ruminant material therein was described by him (1937).

In the company of E. L. Furlong, I visited the San Pedro Valley in 1928, and together we made a small collection of mammal remains, including the type of *Simonycteris stocki*, from the Curtis ranch for the California Institute of Technology. Again in 1936 I was permitted to revisit the San Pedro Valley for the Smithsonian Institution, and the party of that season was successful in securing additional specimens of small mammals from both the Benson and Curtis ranch localities. A popular account of the 1936 expedition was included in the Smithsonian Institution report of explorations for that year.

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OCCURRENCE AND PRESERVATION OF THE MATERIAL

The principal sites in the San Pedro Valley from which collections were made have come to be known as the Benson and Curtis ranch localities (pl. 42). The Benson occurrence is about 2 miles south of the town of Benson to the west of the San Pedro River. The location is given by Gidley as sec. 22 (this appears to be sec. 21), T. 17 S., R. 20 E. (1926, p. 85), and all the Benson rodent and lagomorph materials collected are stated by him (1922, p. 119) to have come from one spot, a fossil bone quarry. The bone from here, though brittle and apparently well petrified, is light buff or ivory in color, superficially resembling recent bone.

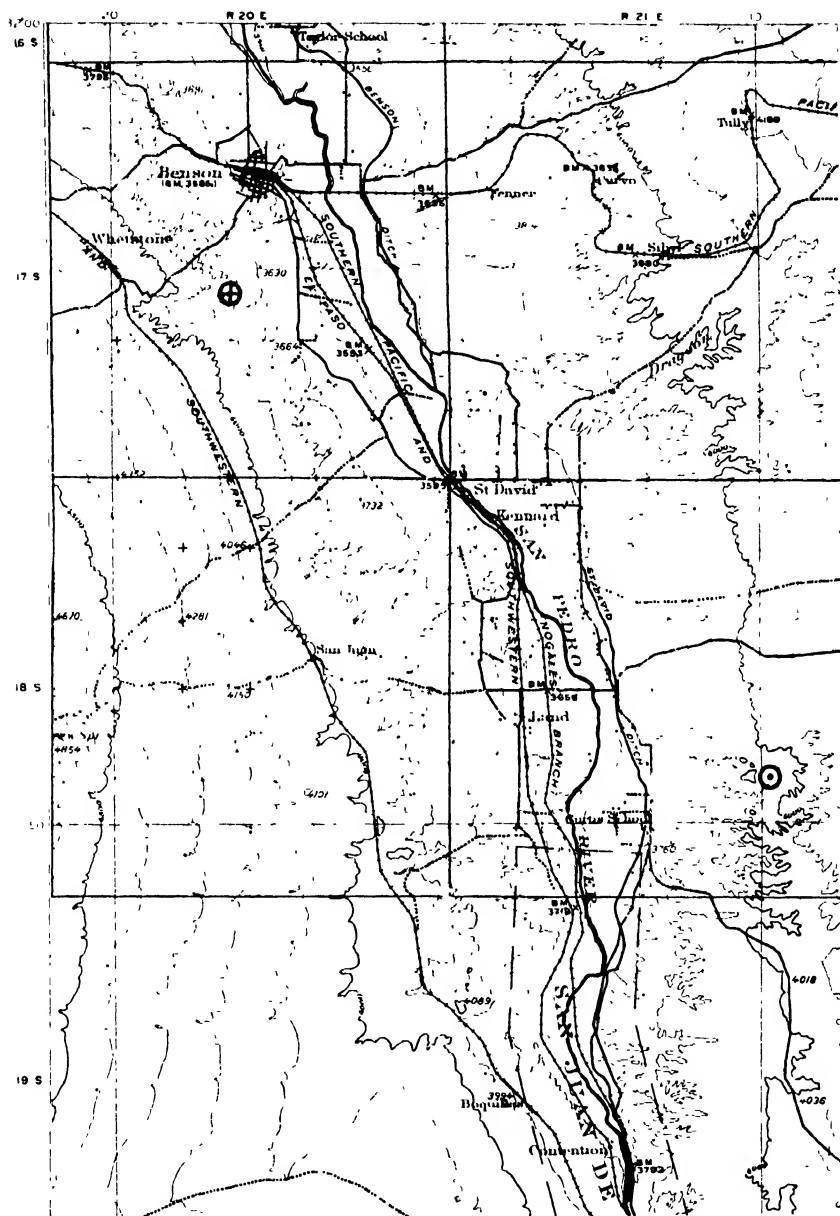
The Curtis ranch locality is about 12 miles southeast of Benson, or about halfway between Benson and Tombstone in a straight line. The mesa at this point is cut back to form a large amphitheatre to the east of the San Pedro River. The locality where Gidley obtained the Curtis ranch rodent collection (pl. 43, fig. 1), one of the mastodons, and a glyptodont (pl. 43, fig. 2) is about 2 miles in a northeasterly direction from the Curtis ranch house, near the line between secs. 28 and 29, T. 18 S., R. 21 E., on land adjacent to the Curtis ranch proper. The rodent, lagomorph, and mustelid material collected by the 1936 party was all from Gidley's locality, although that collected for the California Institute of Technology in 1928 was from a site about half a mile or more to the west and nearer the ranch house. The bone from the Curtis ranch embayment is light gray or nearly white to black, and often much checked, with calcareous material adhering to it. The small mammal jaws from the rodent locality are nearly all slate-gray or black in contrast to the buff or ivory colored Benson specimens.

The manner in which the fossil materials accumulated in the San Pedro Valley deposits has been discussed by Gidley (1926, p. 84), and his rather vivid account is included herewith:

The stratified beds of these localities consist principally of red clays, sands, and soft limestones that were evidently laid down in salt lakes of small extent in the central part of the Pliocene basin.

The bones occur for the most part in relatively small patches or layers of greenish tuffaceous clay, which, according to Bryan, interfinger on one side with arkosic gravel and conglomerate typical of deposition on alluvial slopes and on the other with the lake beds. This position seems to confirm Bryan's view that these bone-bearing patches of greenish clay represent the marginal and fresh-water springs that are characteristic of the borders of salt lakes in such basins. The localities thus probably constituted the chief watering places for the animals of the region, and here naturally occur their fossil remains.

That these areas were once boggy water holes is supported by the condition and arrangement of the bones they contain. For example, the skull of one of the mastodons was found completely covered by the undisturbed original matrix



Portion of Benson Quadrangle, Arizona, U. S. Geological Survey, showing location of Benson (⊕) and Curtis ranch (⊙) fossil localities. Scale: About 3 miles to the inch. Contour interval: 100 feet.



1. View northeastward overlooking Curtis ranch *Stegomastodon* and rodent locality in foreground.



2. View westward across San Pedro Valley from Curtis ranch *Glyptotherium* locality in the immediate foreground. Whetstone Mountains in background.

and lying in a horizontal position resting on the lower jaws, but the top portion of the skull was crushed and eroded and the tips of the tusks reaching to the same level were broken. This damage had evidently been done while the skull yet lay partly buried in wet mud. Also the left fore leg of this animal was found in nearly normal position relative to the skull, but with the toes directed downward, reaching a level in the clay 2 feet below it. This position indicates that the animal came to his death by being hopelessly bogged. The position and arrangement of the other bones as found suggested that they had been moved about by being more or less trampled and disturbed by contemporary animals who were so fortunate as to escape being engulfed in the soft and sticky mud. A foot of each of the other two mastodons collected was found in a like position, giving additional evidence of boggy conditions. The carapace of *Glyptotherium* showed evidence of trampling. The top had been caved in before being completely covered and may have been thus crushed by the foot of a *Stegomastodon arizonae* while being partly buried.

SAN PEDRO VALLEY FAUNAS

A comparative list of the faunas from the two localities is given below:

BENSON	CURTIS RANCH
AMPHIBIA:	
Amphibian remains	
REPTILIA:	REPTILIA:
Testudinata	Testudinata
Kinosternidae	Testudinidae
<i>Kinosternon arizonense</i>	<i>Testudo</i> sp.
Gilmore	
Squamata	Squamata
Iguanidae	Colubridae
<i>Crotaphytus?</i> sp.	Colubrid sp.
AVES:	AVES:
Colymbiformes	
Colymbidae	
<i>Colymbus</i> sp.	
Anseriformes	
Anatidae	
<i>Querquedula</i> sp.	
<i>Dendrocygna eversa</i>	
Wetmore	
<i>Anadernicula minuscula</i>	
(Wetmore)	
Anatid (indet.)	
Galliformes	Galliformes
Meleagridae	
<i>Agriocharis</i> sp.	
Phasianidae	Phasianidae
<i>Colinus</i> sp.	Odontophorid (indet.)
Gruiformes	
Rallidae	
<i>Gallinula</i> sp.	

Charadriiformes

Scolopacidae

Micropalama hesternus

Wetmore

Passeriformes

Corvidae

Corvus sp.

Fringillidae

Junco sp.

Fringillid (indet.)

MAMMALIA :

Carnivora

Canidae

Canid sp.

Mustelidae

Mustelid? sp.

Felidae

Felis sp.

Rodentia

Scuridae

Citellus bensoni Gidley

Heteromyidae

Prodipodomys? *minor*
(Gidley)

Geomyidae

Nerterogeomys? *minor*
(Gidley), n. gen.*Cratogeomys bensoni*
Gidley

Cricetidae

Baiomys minimus
(Gidley)*Peromyscus* sp.

Columbiformes

Columbidae

Columba micula

(Wetmore)

Passeriformes

Fringillidae

Fringillid (indet.)

MAMMALIA :

Chiroptera

Vespertilionidae

Simonycteris stocki

Stirton

Edentata

Glyptodontidae

Glyptotherium arizonae

Gidley

Carnivora

Canidae

Canis edwardii, n. sp.

Mustelidae

Spilogale pedroensis, n. sp.

Felidae

Felis sp., near *F. lacustris*
Gazin*Felis* sp., near *F. atrox*

Leidy

Rodentia

Scuridae

Citellus coctisei Gidley

Heteromyidae

Cf. Perognathus sp.
Dipodomys gidleyi Wood
Dipodomys sp.

Geomyidae

Nerterogeomys persimilis
(Hay), n. gen.

Cricetidae

Baiomys brachygnathus
(Gidley)*Onychomys pedroensis*
Gidley

<i>Bensonomys arizonae</i> (Gidley), n. gen.	<i>Sigmodon curtisi</i> Gidley
<i>Onychomys bensoni</i> Gidley	<i>Sigmodon minor</i> Gidley
<i>Sigmodon medius</i> Gidley	<i>Ondatra</i> sp.
<i>Neotoma fossilis</i> Gidley	
Lagomorpha	Lagomorpha
Leporidae	Leporidae
<i>Hypolagus</i> sp.	<i>Lepus</i> sp., near <i>L. californicus</i> Gray
<i>Sylvilagus?</i> <i>bensonensis</i> , n. sp.	<i>Sylvilagus</i> sp., near <i>S. floridanus</i> (Allen)
Leporid sp.	
Proboscidea	Proboscidea
Mastodontidae	Mastodontidae
<i>Cordillerion bensonensis</i> (Gidley)	<i>Stegomastodon arizonae</i> Gidley
Mastodont sp.	
Perissodactyla	Perissodactyla
Equidae	Equidae
<i>Nannippus</i> cf. <i>phlegon</i> (Hay)	<i>Equus</i> sp.
<i>Plesippus</i> sp.	
Artiodactyla	Artiodactyla
Tayassuidae	
<i>Platygonus</i> sp.	
Camelidae	Camelidae
Camelid sp.	Camelid sp.
	<i>Tanupolama</i> cf. <i>longurio</i> (Hay)
Antilocapridae	Antilocapridae
Antilocaprid sp., possibly	Cf. <i>Capromeryx gidleyi</i> Frick
<i>Taoceros</i> sp.	Cervidae
	Cf. <i>Odocoileus</i> sp.

AGE AND ENVIRONMENT OF THE FAUNAS

Gidley originally contended that both the Benson and Curtis ranch deposits were of late Pliocene age, based on what he considered to be a peculiar mingling of modern and more ancient forms. In 1926 he tentatively assumed that the Benson fauna was slightly older than that of the Blanco, and the Curtis ranch assemblage was a little younger. It should be noted, moreover, that the Blanco at that time was regarded as about middle Pliocene in age. Gidley's conclusions were arrived at under handicap, through lack of comparable faunas in other areas with which comparisons could be made, except for that of the Blanco with its dearth of smaller forms. He anticipated, however, that the San Pedro Valley faunas would eventually become standards of reference for the stages represented.

The Benson fauna may well be equivalent in age to that of the Blanco, although the faunas are not strictly comparable, perhaps

owing to environmental or geographic factors, but probably in a greater measure to chance preservation and collecting procedure. The horses represented, and in particular *Nannippus phlegon*, appear to be the strongest clue to their relative positions. The stage may be considered as belonging in upper Pliocene time as represented in our North American continental sequence. It definitely falls in the interval which we now call Blancan. Among the other known faunas of Blancan age are those from near Hagerman,¹ Idaho; Meade County,² Kans.; and several localities in California, including those currently recognized under the local faunal names Coso Mountains,³ San Joaquin,⁴ San Timoteo,⁵ and Tehama.⁶

The Curtis ranch horizon was immediately recognized by Gidley as being somewhat younger than the Benson level, but considered to be Pliocene also. The reasons given for regarding the Curtis ranch level as pre-Pleistocene were somewhat mingled with those intended for the Benson stage, but may be segregated for the later horizon as pertaining to the mastodont, glytodont, canid, "*Merycodus*," and the rodents in general. Later work has shown, however, that *Stegomastodon* is known elsewhere in Pleistocene deposits, and the Curtis ranch form appears intermediate between *S. texanus* of the Blanco and *S. aftoniae*. The latter is regarded as somewhat younger than true Aftonian. *Glyptotherium arizonae* is more advanced than the Blanco form, and glyptodonts in general are known from much later stages of the Pleistocene, as in Florida. The "canid" humerus (fig. 44), exhibiting an entepicondylar foramen, was found to belong beyond question to a cat, as were all other parts of the same skeleton found near the rather modern appearing canid skull and jaws. The "*Merycodus*" material (fig. 47) is recognized as being antilocaprid and probably belongs to the species that Frick has named *Capromeryx gidleyi*. The rodents are all truly extinct species, but this does not preclude an early Pleistocene age.

Gidley was inclined to disregard the presence of *Equus* in the fauna. The species represented is not determined, and although it appears to be true *Equus*, it is not greatly removed from the *Plesippus* stage. This is shown in particular by a collection of upper teeth described in Gidley's notes as coming from the same level and about a hundred yards from a quarry that produced one of the mastodonts, *Canis edwardii*, the small cat, and Gidley's entire Curtis ranch rodent collection. Contributing to the evidence for a Pleistocene age assign-

¹ C. L. Gazin, Proc. U. S. Nat. Mus., vol. 83, pp. 281-320, 1936.

² C. W. Hibbard, Trans. Kansas Acad. Sci., vol. 40, pp. 239-265, 1937.

³ J. R. Schultz, Carnegie Inst. Washington Publ. 487, pp. 75-109, 1937.

⁴ J. C. Merriam, Trans. Amer. Philos. Soc., new ser., vol. 22, pt. 3, pp. 32-42, 1915. (As upper Etchegoin.)

⁵ Childs Frick, Univ. California Publ. Bull. Dept. Geol., vol. 12, No. 5, pp. 314-334, 1921.

⁶ R. D. Russell and V. L. Vander Hoof, Univ. California Publ. Bull. Dept. Geol. Sci., vol. 20, No. 2, pp. 11-21, 1931.

ment is the presence in the collection obtained from the above mastodont quarry of remains of true *Lepus* and apparently *Sylvilagus*, rather than *Hypolagus*.

The absence of *Nannippus* from the Curtis ranch occurrence, geographically so close to that of Benson, can scarcely be attributed to collecting chances or methods, as horse material of a fragmentary nature was observed at many places in the two areas, and none in the Curtis ranch embayment were of the *Nannippus* type. However, teeth of the Curtis ranch type of *Equus* were found by Bryan near a powder mill a couple of miles south of the Benson locality, opposite the town of St. David. These can scarcely be said to occur at the Benson level, but indicate rather the occurrence of deposits of Curtis ranch age on the west side of the valley, undoubtedly at a level stratigraphically higher than that nearer Benson.

It has been argued that there cannot be an appreciable time interval between the Curtis ranch and Benson occurrences because they occupy similar stratigraphic positions in the San Pedro Valley sequence. It is true that the interval between them is probably not great, but the distance and topographic features separating the two localities preclude any but speculative geologic correlation, nor is there any need to regard the sequence as having accumulated in a relatively short time.

To account for the differences between the faunas of the two localities and at the same time preserve what appears to be a nearly equivalent stratigraphic position, Gidley supposed that the Curtis ranch fauna as known did not evolve from that represented at Benson. This is in part obvious but is not necessarily proved for certain forms that may have come through, such as the larger cat and camel, the antilocaprid, kangaroo rat, pocket gophers, *Baiomys*, grasshopper mice, and cotton rats. Were the Benson fauna more completely known it seems likely that an even larger portion of the Curtis ranch ancestry would be included. In line with this it may be noted that glyptodont material was found in association with *Nannippus* and *Plesippus* from what may be regarded as the Benson stage in the nearby Gila Valley.

The forms that seem most likely to have been involved in important migrations during the interval between Benson and Curtis ranch time are the horses, deer, mastodonts, and lagomorphs, these together giving the more obvious criteria for age assignment.

Recently a relatively large fauna has been reported by Barbour and Schultz⁷ from deposits in Morrill County, Nebr., regarded as early Pleistocene. This, the Broadwater fauna, has not been reported in full, and only a tentative list of the forms represented has been pub-

⁷ E. H. Barbour and C. B. Schultz, Amer. Mus. Nov., no. 942, pp. 1-10, 1937.

lished, but these suggest the possibility of a stage not greatly different from that at Curtis Ranch.

The fauna from near Grand View, Idaho, studied in part by Wilson and the writer, has not been completely recorded. This fauna might be of a relatively early Pleistocene stage but appears to be close to that of Hagerman and may well be a slightly later stage of Blancan or upper Pliocene. The rodents, lagomorphs, and carnivores are more closely related to those of Hagerman than the Curtis ranch forms are to those of Benson. The horse from Grand View is regarded by J. R. Schultz as *Plesippus idahoensis*, a much larger form than *P. shoshonensis* and nearer true *Equus*.

Comparison of the San Pedro Valley faunas with that of Hagerman brings out a number of interesting facts pertaining to the environments of each. Although the Benson fauna is evidently close in age to that of Hagerman, the two San Pedro Valley faunas are more strikingly alike in the type of environment indicated, and quite unlike the Hagerman assemblage. The rodent group is most significant as indicative of habitat, and in both San Pedro Valley faunas has a large percentage of the more brachydont cricetine forms. These genera, though nearly all wide ranging in the modern fauna, are abundantly represented in tropical to arid southern regions. The heteromyids are related to forms of common occurrence in the desert regions of the Southwest. However, a watered area is in no way precluded, and is evident from the avifauna and suggested by certain of the rodents. Standing water or streams of a saline nature would discourage the more water-loving types of mammals, though ducks and the like might be plentifully represented.

In contrast to this the Hagerman fauna shows a preponderance of forms associated with fresh water. These include fishes, frogs, aquatic birds, otter, beaver, and muskratlike forms. The birds are all aquatic, otters are the most common of the Carnivora, and the rodents are predominantly beaver or of the hypsodont, microtine type of cricetids.

SYSTEMATIC DESCRIPTION OF THE BENSON MAMMALIAN FAUNA

Order CARNIVORA

Canid sp.

A relatively large canid is indicated by the presence in the Benson collection of an incomplete third metatarsal, No. 12859. The bone is proportioned about as in material of *Aenocyon dirus* from Rancho La Brea but is somewhat larger. In robustness it compares favorably with a third metatarsal from the Pliocene at Long Island, Kans., referred to *Delurodon*, but though incomplete distally, the Benson specimen appears to have been longer.

Mustelid ? sp.

Gidley (1922, p. 120) indicated in his list of the San Pedro Valley faunas the presence of mustelid material in the Benson as well as in the Curtis ranch collections. I have been unable to find any specimen of this type in the Benson collection, and although it may have been lost it is possible that the check in Gidley's table indicating its occurrence at Benson may have been a misprint. However, Osborn in his proboscidean monograph (1936, p. 680) indicated in a list of the combined San Pedro Valley faunas the presence of material of a small species of mustelid in the American Museum Benson collection, presumably that made by Gidley in 1924. This too, Dr. Granger informed me, does not seem to be extant. It is highly probable that mustelids were in the Benson fauna, but since this cannot be demonstrated the listing of such is queried.

FELIS sp.

The distal portion of a humerus and three incomplete toe bones of a large cat were found by me near the Benson locality in 1936. The portion of a humerus exceeds in size corresponding material of *Felis concolor* in the National Museum collections but can be closely matched in one of the jaguar skeletons. The fragment, however, shows no important characters allying it to either the puma or jaguar, and the entepicondylar foramen differs somewhat from that in both in being more slitlike and not so distally placed.

Order RODENTIA

CITELLUS BENSONI Gidley

The ground-squirrel material from the upper Pliocene locality near Benson includes the type, No. 10531, consisting of M^1 (probably) and part of P^4 from the right side and M^3 from the left, three lower jaw portions from different individuals exhibiting one, two, and three teeth each, and a few isolated lower teeth.

Citellus bensoni is a little smaller than *C. (Otospermophilus) beecheyi*, and the teeth are not of the true *Citellus* type, in which there is a development of high, compressed transverse lophs, but correspond more nearly to those in forms belonging to the *Otospermophilus* group, in which some character of the individual cusps is retained. The lingual portion of the upper teeth, notably M^1 , does not appear to be so extended anteroposteriorly with the crests at the anterior and posterior margins of the tooth joining the protocone without so marked a lingual expansion. The metaconule in M^1 is conical, more clearly separated from the protocone and closer to the metacone than in M^1 of *Otospermophilus* dentitions, somewhat as in

P⁴ of the modern material. In the preserved portion of the fossil P⁴ the conical metaconule is even more closely joined to the metacone, also in P⁴, the crest at the anterior margin of the tooth appears better developed than in Recent *Otospermophilus*, almost as prominent as in M¹ but for a much less portion of the width of the tooth. M³ has a relatively smaller talon portion, and shows a small conical cusp in the basin somewhat lingual to the center. Moreover, none of the upper teeth of the type show a mesostyle as seen in upper teeth of some individuals of *O. beecheyi*.

The lower teeth in jaws referred to *C. bensoni* even more closely resemble those in *Otospermophilus* forms. The differences are not striking and consist principally of a slight but distinct notch dividing the crest between the metaconid and protoconid of M₁ (suggestive of P₄), a somewhat more deepened basin immediately adjacent to the crest between the protoconid and hypoconid in all, and a relatively small talonid on M₃.

PRODIPDOMYS ? MINOR (Gidley)

A single right mandibular ramus, No. 10499, in the Benson collection apparently represents an ancestral form close to *Dipodomys*. The specimen includes the incisor and P₄, and exhibits the alveoli for the molars. It is incomplete anteriorly along the inner wall of the incisor and the angle is not entirely preserved.

The jaw of *Prodipodomys ? minor* is a little smaller and slenderer than in *Dipodomys ordii*. The symphyseal portion and ascending ramus are shorter and the coronoid relatively smaller than in *D. ordii*, although the length of the tooth row is comparable, as indicated by the alveoli. The masseteric crest is for the most part indistinct but terminates anteriorly in a conspicuous swelling, not so prominent, however, as in most recent material. Also, the fossa lingual to the ascending ramus and posteroexternal to the molars is not nearly so deep or so well defined.

P₄ conforms very closely to that in *D. ordii*, and the pattern can be closely if not exactly matched in Recent teeth. M₁, however, was distinctly larger than in *D. ordii*, and appears from the configuration of bone in the bottom of the alveolus to have had small roots, as indicated for *Prodipodomys kansensis*.⁸ M₂ was a little smaller than M₁, and M₃ appears to have been distinctly small, smaller than in *D. ordii*.

A. E. Wood (1935, pp. 155-156) referred a specimen, Amer. Mus. No. 27790, from the Curtis ranch locality to this species. It seems probable, however, that the form represented is not the same. Wood states that the molar (M₁) is rootless, an advance over the rooted

⁸ C. W. Hibbard, Trans. Kansas Acad. Sci., vol. 42, p. 453, 1939.

condition indicated by the alveolus of the otherwise hypsodont M_1 in the type of *P. ? minor*.

The evidence of small rootlets on M_1 of *P. ? minor* might suggest that this form should be referred to *Cupidinimus*; however, teeth in *P. ? minor* are markedly hypsodont, and correspondence to the modern genus, *Dipodomys*, in this and other characters seems much closer than to *Cupidinimus*, as characterized by the genotype, *C. nebraskensis*.

Upper teeth, Amer. Mus. No. 21835, from the Benson locality, which Wood (1935, pp. 146–148) referred to *Cupidinimus magnus*, include grooved upper incisors as in *Dipodomys*, but the first two cheek teeth preserved are stated to be rooted. These are markedly hypsodont though much worn. On the basis of Wood's description it seems probable that these are upper teeth of *P. ? minor*.

NERTEROGEOMYS ? MINOR (Gidley)

The Benson species described by Gidley as *Geomys minor* is believed to represent the new genus *Nerterogeomys*, described in the portion of this paper concerned with the Curtis ranch fauna, and having for a type the species *Geomys persimilis* Hay.

The type of *Nerterogeomys ? minor* is a right mandibular ramus, No. 10494, with the incisor and P_4 to M_2 . To this was referred an upper incisor, No. 10534, and a few isolated cheek teeth. Unfortunately, the illustration given by Gidley for the upper incisor was interchanged with that for a *Cratogeomys bensoni* incisor, so that the small incisor shown in his plate 34, figure 11, is actually that belonging to *Nerterogeomys ? minor* and not *Cratogeomys bensoni*.

The lower jaw of *N. ? minor* is a little smaller than that of *Geomys texensis* and with somewhat narrower teeth, although the enamel on these is arranged as in the living species. The fossa for the temporal muscle on the lingual side of the ascending ramus and posterolateral to the molars is not so deep and does not extend so far forward as in Recent *Geomys* but is apparently better developed than in *Thomomys*. Also, the masseteric crest extends a little farther forward with respect to the cheek teeth, with the mental foramen below its anterior extremity as in *Nerterogeomys persimilis*, lower and more posteriorly placed than in *Geomys texensis*.

The upper incisor referred to this species conforms in size and is of the bisulcate type characteristic of *Geomys* and *Nerterogeomys*.

CRATOGEOMYS BENSONI Gidley

The type of *Cratogeomys bensoni* is a left lower jaw, No. 10495, carrying all the cheek teeth but lacking the incisor. To this species were referred four additional lower jaws having various teeth preserved and an isolated upper and lower incisor. As noted in the above description of *Nerterogeomys ? minor*, the figure of the upper

incisor of *C. bensoni* in Gidley's paper on these rodents was interchanged with that of *N. ? minor*, so that the tooth shown in his plate 34, figure 8, is actually that intended to portray *C. bensoni* rather than *N. ? minor*.

Cratogeomys bensoni is a much larger pocket gopher than either the later *Nerterogeomys persimilis* or the contemporary *N. ? minor*, about equaling in size *Geomys breviceps* and some specimens of *Cratogeomys castanops* of the Recent fauna of Texas. *C. bensoni* was regarded as belonging to *Cratogeomys* on the basis of the upper incisor, which exhibits a single median groove; however, on close inspection it appears that there is a very slight inner groove at certain points along the length of the incisor. Nevertheless, the development of an inner groove is not comparable with that in typical *Geomys*. Some of the other more southern forms such as *Platygeomys* are characterized as in *Cratogeomys* by a single median groove, but the differences between these various *Geomys*-like gophers may not be of more than subgeneric importance.

The lower jaw of *C. bensoni* is a little slenderer than in the Recent forms, *Geomys breviceps* and *Cratogeomys castanops*, and the fossa for the temporal muscle, though much better developed than in *N. ? minor*, is not so deep as in *G. breviceps* or nearly so deep as in Recent *Cratogeomys*. The masseteric area and crest are not so expanded laterally. The mental foramen is posterior in position and more nearly ventral to the anterior extremity of the masseteric crest than in either Recent *Geomys* or *Cratogeomys* but does not differ in this respect from the Recent material so much as do *N. ? minor* and *N. persimilis*.

The lower cheek teeth have the enamel distributed as in *Geomys* and *Cratogeomys*, but are a little narrower than in the Recent forms, and the reentrants separating the columns of P_4 are more open than in *Geomys*, although in the type the reentrants do not so effectively separate the columns as in Recent *Cratogeomys*. However, in two of the specimens referred to *C. bensoni* the columns of P_4 are connected by a narrow, elongate isthmus almost as in *Cratogeomys*, though possibly not so constricted. M_3 , present in the type only of *C. bensoni*, has a slight constricted portion at the posterior margin, or grooved as Gidley has indicated.

BAIOMYS MINIMUS (Gidley)

The type and only known specimen of this species is a left lower jaw, No. 10500, with all the teeth. The jaw and teeth are slightly smaller than in *Baiomys taylori* or the Curtis ranch *Baiomys brachygnathus*. The teeth, though a little worn, appear to be more brachydont than in *B. taylori*, and as noted by Gidley, the anterior lobe of the first tooth is narrow and double cusped. In *B. brachygnathus*

this tooth is wider anteriorly but is so worn that any division of the anterior cusps has been obliterated. The last tooth in *B. minimus* is reduced to about the extent seen in *B. taylori*, not so much as in *B. brachygnathus*.

PEROMYSCUS sp.

A single right ramus, No. 10502, lacking the cheek teeth, but possessing the incisor seems referable to *Peromyscus*. The tooth row as indicated by the alveoli is slightly longer than in the material of *Peromyscus maniculatus gambelii* examined, to which form Gidley compared the specimen, but is more nearly comparable, except for the slenderness of the incisor, to specimens of *P. truei truei* or *P. eremicus anthonyi* from the modern fauna of Arizona.

BENSONOMYS, new genus

Generic characters.—Near *Eligmodontia* with knoblike process at anterior extremity of masseteric crest on lower jaw, last lower cheek tooth reduced, and sulcus between capsular and coronoid processes. Removed from *Eligmodontia* in having deeper lower jaw, dorsally placed mental foramen closer to process at extremity of masseteric crest, more brachydont cheek teeth, notch on anterior lobe of first lower cheek tooth better developed, lower incisor more procumbent.

Genotype.—*Eligmodontia arizonae* Gidley.

BENSONOMYS ARIZONAE (Gidley)

In addition to the type, which is a left lower jaw, No. 10503, with a complete dentition this species is represented in the Benson collection by three other jaw portions that have preserved one, two and three cheek teeth, respectively. The incisor is present in each, except the jaw with one cheek tooth.

In Gidley's paper on the San Pedro Valley rodents the illustrations pertaining to "*Eligmodontia*" *arizonae* were unfortunately mixed with those of *Onychomys bensoni*, so that the citation, plate 34, figure 15, preceding the text for "*E.*" *arizonae*, refers to a photograph of the type of *O. bensoni* that in no way conforms to the description given for "*E.*" *arizonae*. The type of *Bensonomys arizonae* is actually shown in plate 35, figure 3, captioned *O. bensoni*. The paratypes of *B. arizonae* together with the description given for the type leave no doubt as to the true identity of type specimens. While the illustrations of the two type specimens involved are of little or no value in portraying the specific characters indicated in the text, they have in the past served to identify, erroneously, the specimens intended as the types, thereby confusing research and comparisons that have been made with these specimens.

B. arizonae is about the size of the living *Eligmodontia morgani* of South America, which it resembles in many respects, and at the same time differs from *Peromyscus*, notably in the anterior extension of the masseteric crest into a prominent knoblike process anteroexternal to the anterior root of the first cheek tooth, the dorsal position of the mental foramen, the reduction of the last lower cheek tooth, and the depth of the sulcus between the capsular and coronoid processes. *B. arizonae* differs from *E. morgani* in having a deeper lower jaw, more brachydont teeth, a more procumbent incisor, a distinctly better developed notch in the anterior lobe of the first cheek tooth, slightly less reduced third cheek tooth, and somewhat more dorsally placed mental foramen which is closer to the prominence at the anterior end of the masseteric crest. The shortness of the symphysis indicated by Gidley cannot be certainly determined, as none of the jaws are sufficiently complete anteriorly, and the incisor appears to have slid backward to a different position in each.

ONYCHOMYS BENSONI Gidley

The right ramus of a mandible, No. 10509, with all the teeth, but lacking part of the coronoid and angle, is the type and only specimen of the Benson *Onychomys*. As noted in the above description of the *Bensonomys arizonae* material, Gidley's figure of the type of *Onychomys bensoni* is labelled *Eligmodontia arizonae*, so that *O. bensoni* is actually shown in his plate 34, figure 15, rather than plate 35, figure 3.

Onychomys bensoni is rather close in size to *Onychomys torridus*. It exhibits the same cusped type of tooth structure seen in modern *Onychomys*, with the narrow, single cusped anterior loph of the first lower cheek tooth, but the teeth are a little lower crowned and the cusps perhaps a little more conical. The third lower cheek tooth is distinctly less reduced, exhibiting a low but much less abbreviated talonid portion than in *O. torridus* or even *O. leucogaster*. The size and height of the coronoid indicated by Gidley cannot be determined, but the basal portion appears to have been of greater anteroposterior extent, as indicated by the length of the broken edge.

SIGMODON MEDIUS Gidley

Five lower jaws, four of which exhibit all the cheek teeth, represent a species of *Sigmodon* in the Benson fauna. The type, No. 10519, a right ramus, which includes the incisor as well as the cheek teeth, and an associated fragment of the right maxilla, with the first two cheek teeth, believed to be from the same individual.

Sigmodon medius is smaller than the modern forms *Sigmodon hispidus* and *Sigmodon sanctae martaе* with which Gidley made comparisons. It is intermediate in size between the two Curtis ranch species,

S. minor and *S. curtisi*. *S. medius* is characterized by being more brachydont than modern forms, hence the appearance of somewhat more open valleys and compressed ridges. The anterior reentrant on the lingual surface of the first lower tooth is deeper than the outer in the type, as was noted in certain material of *S. sanctae martaе*, but the anterior lobe is distinctly narrower than in modern material. Perhaps the most significant character in the lower teeth is the depth of the posterior reentrant on the lingual surface of the second cheek tooth, a distinct notch being present in this position on the third tooth. This reentrant and perhaps the notch, however, are not so well developed as in material of *Holochilus* from Argentina. Moreover, the posterior portion of the lingual wall of the third cheek tooth makes a sharp angle with the posterior wall of the lingual reentrant, this angle being more rounded in *S. hispidus* material.

In the upper cheek teeth of the type the anterior lobe of the first is narrow as it is in the lower teeth, and as noted by Gidley the external reentrants appear a little more arcuate in an occlusal view.

NEOTOMA FOSSILIS Gidley

The type of *Neotoma fossilis* is a right maxillary portion, No. 19524, with the first cheek tooth preserved and showing the alveoli for the second. To this were referred two right lower cheek teeth, No. 10526, and the greater portion of a left lower jaw, No. 10525, exhibiting the incisor but no cheek teeth.

The first upper cheek tooth in the type is about as wide as in *Neotoma cinerea* but distinctly shorter and lacks the anterointernal fold on the anterior column. The lower teeth referred are also relatively short and wide, and again, the first of these lacks the fold on the anterointernal surface of the anterior column. Possibly a less deeply impressed anterointernal fold may have been present in first upper and lower cheek teeth at an earlier stage of wear, but these cannot have been developed to the extent seen in some of the modern material. Both the upper and lower teeth are well worn so that the reentrants are compressed; however, the posteroexternal of these in the lower teeth is somewhat more open and more noticeably pocketed than the others, a condition markedly developed in material of *Neotoma magister* from Cumberland Cave.⁹ Moreover, as Gidley indicated, the cross lophs of the lower teeth, particularly the second, are noticeably oblique; however, this may in part be due to the stage of wear represented together with the greater vertical depth and open character of the posteroexternal folds and the depth of the anterior of the two internal folds.

⁹ J. W. Gidley and C. L. Gazin, U. S. Nat. Mus. Bull. 171, pp. 59-60, 1938.

Order LAGOMORPHA

HYPOLAGUS sp.

The lagomorph material, No. 10529, from the Benson locality, which Gidley referred to Species No. 2, clearly represents *Hypolagus*. Gidley's description as well as an examination of the material shows this to be the case; however, the specimen is too fragmentary to warrant detailed comparisons with other species of the genus. Nevertheless, P_3 in this material is seen to be a little larger than this tooth in *Hypolagus browni* from Anita, Ariz.

Certain of the upper teeth included in No. 10535, which Gidley referred to as cf. *Lepus* sp. from the Benson locality, appear to represent *Hypolagus*, although an incomplete P_3 under this number may represent *Sylvilagus* ? *bensonensis*. Probably more than one individual is included in the material.

SYLVILAGUS ? BENSONENSIS, new species

FIGURE 39

Type.—Left ramus of mandible, U.S.N.M. No. 16595, including P_3 to M_1 inclusive.

Locality.—About 2 miles south of Benson, Ariz., in exposures on the west side of the valley.

Horizon.—Possibly Benson (Late Pliocene) in age, though not from quarry worked by Gidley and Bryan.

Specific characters.—Size near *Sylvilagus floridanus holzneri* now living in Arizona. Jaw relatively robust. P_3 without reentrant from anterior wall but anterior external reentrant deep and complex.

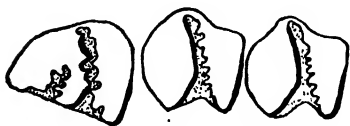


FIGURE 39.—*Sylvilagus* ? *bensonensis*, new species: Left lower cheek teeth, P_3 to M_1 (U.S.N.M. No. 16595), type specimen, occlusal view of enamel pattern. Approximately $\times 6$. Benson upper Pliocene, Arizona.

Description.—The fossil jaw is near specimens of *Sylvilagus floridanus holzneri* or *S. auduboni cedrophilus* in size, but appears relatively robust, particularly in depth anterior to the cheek teeth. The most noticeable differences, however, are to be seen in the enamel pattern of P_3 . The posterior portion of all the folds from the buccal surfaces of the cheek

teeth are markedly crenulated, but in P_3 the anterior reentrant from the outer surface is much more deeply impressed and more highly crenulated than in any of the modern *Sylvilagus* material which I have examined. Moreover, this tooth lacks the reentrant from the anterior wall seen in *Sylvilagus*, *Lepus*, and certain other genera. Some forms of *Sylvilagus*, etc., have two reentrants on the anterior wall, whereas in *Romerolagus* and *Brachylagus*, forms otherwise distinct from *S. ? bensonensis*, P_3 shows little or no fold in this

position. The San Pedro Valley jaw represents a form which might be regarded as generically distinct from *Syvilagus*.

Measurements in millimeters

	I	P ₁	P ₄	M ₁
Anteroposterior diameter_____	¹ 2.0	2.8	2.2	2.2
Transverse diameter_____	2.3	2.2	2.5	2.5

¹ Approximate.

Leporid sp.

A relatively large lower jaw, No. 10530, designated as Species No. 1 from Benson cannot be referred with certainty to any of the genera inasmuch as P₃ is missing. Only M₁ and part of P₄ are included in the jaw, and these are much larger than in *Syvilagus* ? *bensonensis*.

Order PROBOSCIDEA

CORDILLERION BENSONENSIS (Gidley)

The basal portion of a mastodont skull, No. 10538, having nearly all the cheek teeth preserved, was described by Gidley (1926, pp. 84–86) as *Anancus bensonensis*. Osborn (1936, pp. 565–566) in his monograph on the Proboscidea reallocated this species to *Cordillerion*, regarding it as close to the species *Cordillerion andium* and *C. edensis*. The cheek teeth were described as brachydont and semibunodont. M² is trilophodont, and M³ tetralophodont with a fifth loph in an incipient stage of development.

A referred tusk in the collections of the American Museum was described by Gidley as being about 4 feet long and 4 inches in diameter and of the nearly straight and twisted variety with a wide band of enamel extending along nearly the entire length. There is no certainty that *C. bensonensis* had this type of tusk, but Gidley states that the form of the tusk “agrees exactly with that of the alveolus in the type of *Anancus bensonensis*.”

Mastodont sp.

In a footnote Gidley (1926, p. 85) mentioned occurrence at the Benson locality of a mastodont tusk quite unlike that regarded as belonging to *Cordillerion bensonensis*. The specimen “was too badly shattered and displaced to be preserved but it showed by the natural mold left in the matrix which had surrounded it that it was of the short, thick, much curved, and rapidly tapering variety; also, there was no evidence of an enamel band.”

Order PERISSODACTYLA

NANNIPPUS cf. PHLEGON (Hay)

FIGURE 40

The type of *Nannippus phlegon*, an isolated lower cheek tooth from the Blanco of Texas, was originally described by Cope¹⁰ as *Equus minutus*, a name preoccupied by *Equus minutus* Marcelles de Serres and probably by *E. minutus* Dubois. Because of this Hay¹¹ proposed the name *Equus phlegon* for the minute Blanco horse, and subsequently this species has been referred to most of the later Tertiary equid genera, including *Merychippus* by Hay, *Protohippus* by Gidley, *Pliohippus* by Osborn, and *Hipparion* by Matthew, until Matthew¹² in 1926 proposed the subgeneric name *Nannippus*, under *Hipparion*, for its reception. *Nannippus* has since come to be regarded as of generic rank.

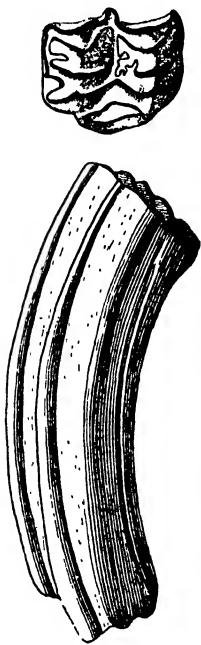


FIGURE 40.—*Nannippus* cf. *phlegon* (Hay): Right upper cheek tooth (U.S.N.M. No. 11745), posterolateral and occlusal views. $\times 1$. Benson upper Pliocene, Arizona.

The published record of the culminating stage of this specialized *Hipparion*-like horse is rather scant although it is known to be represented in several late Pliocene deposits in the Southwest. Matthew's characterization, rather brief and based on material from the Blanco beds, is as follows:

One group of small American species (new subgenus *Nannippus*) has the teeth very long crowned, up to a fourth longer than in any living horse; oval protocones and extremely slender limbs and feet, in which the side toes are complete but no trace remains of the fifth digit and trapezium. This group is typified by *Hipparion phlegon* of the Blanco formation, of which I secured skulls, feet, etc., in 1924. Contrast it with the contemporary *Plesippus*, with stout limb and foot bones, the side toes reduced to splints but the trapezium and fifth digit still retained.

Three incomplete lower jaws with milk dentitions, several isolated teeth, foot bones, and fragments of limb bones from the Benson locality belong to a small *Hipparion*-like horse, which seems with little doubt to represent *Nannippus phlegon*, although the material from the Blanco, which Matthew collected, was never illustrated or adequately described. The Benson *Nannippus* has extremely hypsodont cheek teeth of rather small cross section, and these may show noticeable curva-

¹⁰ E. D. Cope, 4th Ann. Rept. Geol. Surv. Texas, for 1892, pp. 67-68, 1893.

¹¹ O. P. Hay, Amer. Geol., vol. 24, p. 345, 1899.

¹² W. D. Matthew, Quart. Rev. Biol., vol. 1, p. 165, 1926.

ture, especially toward the ends of the series. In the lower dentition the curvature is almost entirely in an anteroposterior plane. The cheek teeth exhibit moderately complex folding of the enamel and the isolated protocone in the upper teeth is generally small and smoothly oval in outline in moderate to advanced wear, although in early stages of wear the protocone may be rather irregular in outline.

The upper tooth here figured (fig. 40), probably *M*², measures about 17.5 by 15.6 mm. in cross section and is about 65 mm. long.

The feet are 3-toed, as in *Hipparion*, but strikingly small and slender. The first phalanx of a third digit measures 51 mm. long, and 23.5 and 20.0 mm. wide at the proximal and distal ends respectively. The hoof is scarcely more than 30 or 35 mm. wide.

PLESIPPUS sp.

In his preliminary report, 1922, on the San Pedro Valley faunas Gidley noted the presence in the Benson collection of horse material other than *Hipparion*, which he referred to *Pliohippus*. Later, however, he regarded these as representing *Plesippus*, as indicated by notations on the specimen labels. The material of *Plesippus* is rather scant and consists of a few isolated cheek teeth, most of which are incomplete, and a few toe bones.

The teeth are large and robust, being generally heavier than in the modern horse, but exhibit certain somewhat more primitive characters distinguishing them from Quaternary forms, particularly in the sharpness of the reentrant between the metaconid and metastylid columns of the lower teeth. The teeth and portions of teeth show a striking resemblance to those in *Plesippus shoshonensis* from Hagerman, Idaho, being in a nearly equivalent stage of development. The toe bones can be closely matched in material of *P. shoshonensis*. As in the zebra, these are relatively small and slender as compared with those in *Equus caballus*.

Order ARTIODACTYLA

PLATYGONUS sp.

Several isolated teeth and a maxillary fragment with two deciduous premolars belong to a species of *Platygonus*. The teeth are of moderate size, close in this respect to those in *Platygonus pearcei*¹³ from the upper Pliocene at Hagerman, Idaho. They are more rugose than in *P. pearcei*, the cingulum better developed, and the anterior and posterior crests seem more sharply separated.

¹³ C. L. Gazin, Journ. Washington Acad. Sci., vol. 28, no. 2, pp. 41-49, figs. 1-3, 1938.

Platygonus is now known to occur in several upper Pliocene deposits, including those at Blanco, Texas; Hagerman, Idaho; Coso Mountain, Calif.; Eden?, Calif.; Meade County, Kans.; and Safford, Ariz., as well as Benson. In those cases where the symphyseal portion of the lower jaw is known at this stage, the third lower incisor is persistent as indicated in the Hagerman and Coso Mountain material.

Camelid sp.

Camelids are represented in the Benson collection by portions of the maxillae of one individual, no. 12856, including M¹ to M³ of the right side and part of P⁴, M¹, and the posterior alveolus for P³ on the left side. A few isolated foot bones were added to the collection in 1936.

The presence or absence of P² cannot be determined, but it may be supposed that at this stage the tooth was absent, as it appears to have been in *Megatylopus*, *Camelops*, and the several other forms which have been named from upper Pliocene and Pleistocene horizons.

The teeth in the maxillae are much worn, so that only a small fraction of an inch remains to the depth of the crown of M¹, and perhaps slightly more than an inch of the rather poorly preserved M³. Because of this, comparisons with material and figures of the various described forms are difficult; however, even at this advanced stage of wear teeth of relatively large size are indicated, having considerable occlusal area.

The form may not have been appreciably larger than some of the material which has been referred to species of *Camelops*. There appears to be noticeable variation in the size of the teeth in specimens from Hay Springs, Nebr., referred to *Camelops kansanus*, and also in material from American Falls, Idaho, referred to *Camelops hesternus*. I doubt if this represents more than individual variation in each case. The Benson teeth compare favorably in size with certain of the larger teeth from these localities, but are noticeably greater than the average.

Comparison with *Megatylopus? spatula* (Cope)¹⁴ from the Blanco formation is not satisfactory inasmuch as the only described material is the type lower jaw. The measurements given by Cope for the lower teeth do not indicate an animal significantly greater in size than the Benson camelid. Matthew and Stirton¹⁵ regarded the Blanco form as representing *Paracamelus*, a genus of large camels described by Schlosser¹⁶ from the Pliocene of China. J. T. Gregory¹⁷ in review-

¹⁴ E. D. Cope, 4th Ann. Rept. Geol. Surv. Texas, for 1892, pp. 70-73, pl. 21, figs. 1-2, 1893.

¹⁵ W. D. Matthew and R. A. Stirton, Univ. California Publ. Bull. Dept. Geol. Sci., vol. 10, No. 17, p. 367, 1930.

¹⁶ Max Schlosser Abh. Bayer. Akad. Wiss., math.-phys. Kl., vol. 22, p. 95, 1903.

¹⁷ J. T. Gregory, Proc. Geol. Soc. Amer., 1936, p. 388, 1937.

ing the camels of the genus *Pliauchenia* considered the Blanco species to belong in *Megatylopus*. Barbour and Schultz,¹⁸ on the other hand, considered *M. ? spatula* to be closer to their *Gigantocamelus fricki*.

No doubt the number of generic as well as specific names that have been applied to late Pliocene and Pleistocene camels of North America will be reduced when further study is made of these forms. The record suggests a group of large camels in the upper Pliocene and early Pleistocene of North America, probably related to *Paracamelus*, with species occurring in the Blanco, Keams Canyon, Hagerman, Lisco, San Pedro Valley, and certain other deposits; secondly, *Camelops*, a group of moderately large and otherwise distinctive camels, remains of which are found at numerous Pleistocene localities; and third, *Tanuropolama*, in upper Pliocene time as well as in various stages of the Pleistocene of North America, being a smaller, long and slender limbed form, related to the South American llama.

Antilocaprid sp., possibly *TEXOCEROS* sp.

Fragments of the right and left rami of an immature mandible, No. 12860, including the deciduous premolars in each and M_1 in the right ramus, and an isolated molar were cited by Gidley as representing a species of *Merycodus*. There is, however, no necessity for regarding this material as merycodont as the teeth are very close to those seen in an immature individual of *Antilocapra americana*. The teeth are relatively small and on the basis of the material at hand can be described only as antilocaprid.

Frick (1937, p. 507) indicated most of an upper dentition and a couple of isolated molars in his collection from Benson which he referred tentatively to *Texoceros* sp. The National Museum specimen may represent this or *Capromeryx* but is too incomplete for satisfactory comparisons.

SYSTEMATIC DESCRIPTION OF THE CURTIS RANCH MAMMALIAN FAUNA

Order CHIROPTERA

SIMONYCTERIS STOCKI Stirton

The anterior portion of a bat skull, Calif. Inst. Tech. Coll. No. 394, collected by the writer in 1928 at the Curtis ranch locality, was described by Stirton (1931) as a new vespertilionid, *Simonycteris stocki*. Its characters were regarded by Stirton as closer to those of *Eptesicus* than other genera of bats.

¹⁸ E. H. Barbour and C. B. Schultz, Univ. Nebraska State Mus., vol. 2, No. 2, p. 24, 1939.

Order EDENTATA

GLYPTOTHERIUM ARIZONAE Gidley

Glyptotherium arizonae is represented principally by three specimens from the Curtis ranch locality. No. 10536, the type, consists of the lower jaws, complete limbs and feet of the right side, a part of the vertebral column, portions of the carapace, and tail rings. No. 10537 includes a nearly complete tail with vertebrae and armature, and portions of the carapace. No. 10336 is the greater part of a carapace and includes a few teeth and foot bones. A composite skeleton has been mounted for exhibition in the National Museum, consisting of the lower jaws and feet of the type, the carapace of No. 10336, and the caudal rings and vertebrae of No. 10537.

Gidley (1926, pp. 91-94) has given a fairly detailed description of this material, particularly with respect to the jaws and limbs, but it may be of interest to note further the manner in which the surface of the carapace varies in pattern. In the middorsal region the depressed central areas of the scutes is only slightly larger in diameter than the marginal surfaces, and with the outer figures interfingering with those of adjacent scutes. The central figure becomes relatively larger in the more peripheral areas; more observable in the forward parts. Also, toward the margin of the carapace the pattern on the individual scutes becomes less distinct, with the central area tending to become raised rather than excavated, and about midway fore and aft the scutes are more nearly quadrilateral. Along the anterolateral apronlike portions the four outer rows of scutes are more nearly in serial arrangement, with backward directed bosses reaching greatest development in the marginal row. The marginal row continues around the nuchal border as knoblike segments distinctly set off from the main mass of the carapace. Posteriorly the marginal series becomes a row of downward and backward directed almost hornlike processes increasing in size to the posterolateral extent of the carapace, and extending over the tail armature in more nearly conical form, directed backward and outward.

The tail armature consists of apparently eight movable, biserial rings and a terminal portion composed of the equivalent of about three rings. The proximal group of segments of each ring is relatively plain, except for a groove that extends around the ring near the anterior margin, giving rise to the illusion of a third row of scutes. The posterior series of each ring exhibits a nearly conical, posteriorly placed prominence on each scute, and from about the fifth ring to the tip of the tail the two adjacent dorsal elements are developed to a greater extent than others.

The carapace of *Glyptotherium arizonae* resembles rather noticeably that of *Glyptotherium texanum*¹⁹ from the Blanco beds, in the pattern and arrangement of the scutes in different areas. Also, the tail armature is composed of 8 free rings and the terminal cone as in *G. texanum*. The number of caudal vertebrae is not less than 12, and at least 10 had chevrons. *G. arizonae* differs from *G. texanum* essentially in the greater development of the marginal scutes of the carapace, and the imbricated anterolateral portions appear to be more noticeably flexed from the main body of the carapace; however, the figured carapace of *G. arizonae* was partially crushed as found. The posterior segments of the movable rings of the tail armature also exhibit better developed bosses, and the eighth ring is completely biserial, also, the two anterior of the three ringlike segments of the terminal cone are more nearly biserial through intercalated scutes than in *G. texanum*.

G. arizonae is more advanced and certainly specifically distinct from *G. texanum*; however, the differences may not be sufficiently important to warrant generic separation. *Boreostracon floridanus*²⁰ or *rivipacis*²¹ is from a much later stage of the Pleistocene and the scutes figured by Holmes and Simpson apparently exhibit a different type of surface pattern, particularly in the middorsal areas where the marginal figures of the scutes are more noticeably grooved and less sharply defined than in *G. arizonae*, and these marginal figures do not appear to interfinger with those of adjacent scutes to the extent seen in *G. arizonae*.

In *Brachyostracon mexicanus* (Cuatáparo and Ramirez)²² the interfingering type of scutes, in which the marginal figures of each are well defined, apparently extend to the periphery of the carapace, although in the illustrations of *Brachyostracon cylindricus* Brown the more lateral scutes appear serially arranged with better developed bosslike central areas than in *B. mexicanus*.

Order CARNIVORA

CANIS EDWARDII, new species

FIGURE 41

Holotype.—Skull and mandible, U.S.N.M. No. 12862.

Locality.—About 2 miles northeast by east of Curtis ranch house, San Pedro Valley, Ariz.

Horizon.—Curtis ranch, early Pleistocene.

¹⁹ H. F. Osborn, Bull. Amer. Mus. Nat. Hist., vol. 19, pp. 491-494, 1903.

²⁰ G. G. Simpson, Bull. Amer. Mus. Nat. Hist., vol. 56, pp. 581-583, 1929; and W. W. Holmes and G. G. Simpson, *ibid.*, vol. 59, pp. 405-418, 1931.

²¹ O. P. Hay, Carnegie Inst. Washington Publ. 322, pp. 89-90, 381, 1923.

²² See Barnum Brown, Bull. Amer. Mus. Nat. Hist., vol. 31, pp. 167-177, 1912.

Specific characters.—Size about equal to that of *Canis rufus* specimens from Missouri and Arkansas. Jaws relatively short with premolars in a nearly continuous series. Lower jaws weak with teeth

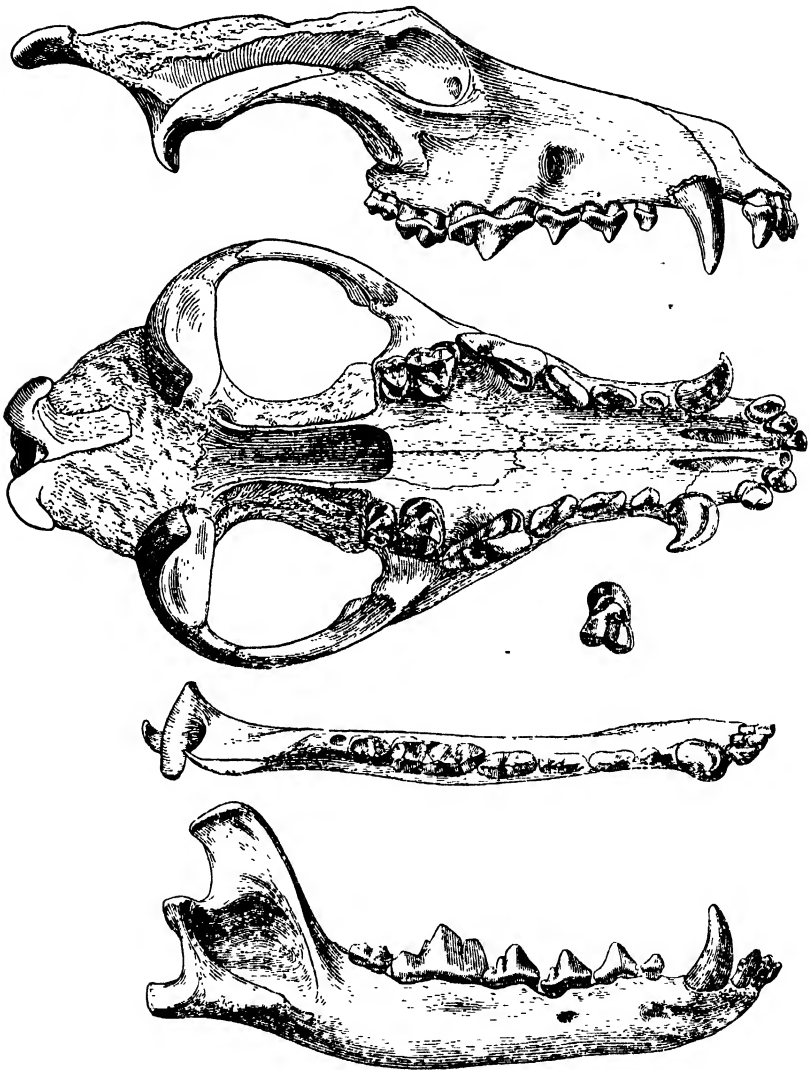


FIGURE 41.—*Canis edwardii*, new species: Skull and right ramus of mandible (U.S.N.M. No. 12862), type specimen; lateral and ventral views of skull, lateral and occlusal views of mandible. A less foreshortened view of the occlusal surface of M^1 is included with the ventral view of the skull. $\times \frac{1}{2}$. Curtis ranch Pleistocene, Arizona.

relatively large. Distance between lower molars and condyle relatively short. Coronoid small and backward projecting. Angle large, well separated from condyle and projecting markedly backward.

Description.—The skull and jaw of *Canis edwardii* (fig. 41) are intermediate in size between those of a gray wolf and of a coyote, about equaling specimens of the red wolf, *Canis rufus*, from Missouri and Arkansas. The skull is badly crushed, obscuring its form, particularly in the cranial region. The jugal appears relatively light and the rostrum somewhat shortened with the premolars more crowded than is usual in *Canis rufus*. The teeth are comparable in size to those in the red wolf and resemble them in structure more closely than they do those of any other species of canids. The deuterocone of the upper carnassial is distinctly developed as in *Canis rufus*. Also, as in *Canis rufus* the cusps of the lingual portion of M¹ are relatively well developed, and the paracone and metacone less inflated than in *Canis lupus*. M², though not so large relatively as is usual in *Canis rufus*, shows a well developed lingual portion with a prominent hypocone. The cingulum anterolingual to the protocone, however, is not so prominent in the fossil.

The lower jaw is also relatively a little shortened and the premolars are in a closely continuous series. The cheek teeth appear relatively large in proportion to the size of the jaw when comparison is made with *Canis rufus*, and the distance between the molars and the condyle is appreciably shorter. The angle is larger and placed lower with respect to the condyle, whereas the coronoid is relatively small and with the angle projects backward more than in the red wolf specimens examined.

Limb material that Gidley considered as associated with the skull, No. 12862, and on which he commented with respect to the presence of an entepicondylar foramen in the humerus (1922, p. 121), surely does not belong to a dog. The various elements are clearly felid in all respects. The association must have been quite accidental.

Measurements in millimeters of upper and lower teeth of Canis edwardii (No. 12862)

Measurement	Upper dentition	Lower dentition
Approximate length of dentition from I1 to M2.....	115	113
Length of cheek teeth from P1 to M2.....	77	82
Length of premolars from P1 to P4.....	60	47.5
Length of molars from M1 to M2.....	22.5	36
Anteroposterior diameter of P3.....	15	13.5
Transverse diameter of P3.....	6.2	6.0
Anteroposterior diameter of P4.....	24.0	15.4
Transverse diameter of P4.....	11.7	7.4
Anteroposterior diameter of M1.....	14.5	25.0
Transverse diameter of M1.....	20.5	9.8
Anteroposterior diameter of M2.....	8.4	11.3
Transverse diameter of M2.....	12.8	8.5

SPILOGALE PEDROENSIS, new species

FIGURES 42, 43.

Holotype.—Right ramus of mandible, U.S.N.M. No. 14682, including the canine, P_4 and M_1 .

Paratype.—Left maxillary portion, U. S. N. M. No. 12869, with P^4 and M^1 .

Locality.—Gidley's rodent locality, about 2 miles northeast by east of Curtis ranch house, San Pedro Valley, Ariz.

Horizon.—Curtis ranch, early Pleistocene.

Specific characters.—Size near *Spilogale ambigua*. P^4 and M^1 with lingual portions not greatly expanded anteroposteriorly. Mandible with symphyseal portion projecting markedly downward and lower margin of ramus irregular. Lower canine robust. Anterior style and posterior transverse crest on P_4 not well developed. M_1 slender, particularly across protoconid and metaconid, and talonid basin well open lingually.



FIGURE 42.—*Spilogale pedroensis*, new species: Left maxillary portion with P^4 and M^1 (U.S. N.M. No. 12869), lateral and occlusal views. $\times 2$. Curtis ranch Pleistocene, Arizona.

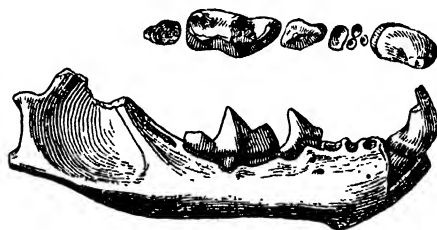


FIGURE 43.—*Spilogale pedroensis*, new species: Right ramus of mandible (U.S.N.M. No. 14682), type specimen, lateral and occlusal views. $\times 2$. Curtis ranch Pleistocene, Arizona.

Description.—The lower jaw (type) of *Spilogale pedroensis* (fig. 43) is about the size of that in male individuals of *Spilogale gracilis* or *Spilogale ambigua* now living in Arizona,²³ being distinctly smaller than that in *Spilogale arizonae*. The horizontal ramus of No. 14682 is distinctive in exhibiting so irregular a lower margin. The symphyseal portion extends markedly downward, and posterior to this the lower margin or profile of the jaw is concave as far as the prominent convexity or angulation directly below the alveolus for M_2 . A second jaw portion, No. 14683, of *Spilogale pedroensis* with somewhat smaller teeth, probably a female, does not show so marked an angula-

²³ A. H. Howell, Revision of the skunks of the genus *Spilogale*. North Amer. Fauna 26, pp. 1-55, 10 pls., 1906.

tion below M_2 . In specimens of *S. ambigua* of equivalent size and maturity the lower margin of the jaw usually exhibits an even convexity almost to the angle, or is but slightly irregular. The type mandible of *S. pedroensis* is further characterized by a short posterior portion as the distance between the carnassial tooth and the condyle is relatively long.

The lower carnassial in the type is distinctly narrower across the protoconid-metaconid portion than in *S. ambigua* or other recent species of *Spilogale* having teeth of about the same size. The talonid portion, however, is not noticeably different in width although the basin appears somewhat more open lingually than in *S. ambigua*, with no suggestion of a cuspule intermediate between the metaconid and entoconid. The canine tooth, on the other hand, is relatively robust and wider than in *S. ambigua*, *S. gracilis*, or even *S. arizonae*. In P_3 the anterior style and posterior transverse crest, arising from the cingulum, are not so well developed as in the recent species of Arizona.

The maxillary portion designated as the paratype, U.S.N.M. No. 12869 (fig. 42), retains only the carnassial and molar. These teeth occlude very well with those in lower jaw No. 14683, presumed to be a female. They compare favorably in size with those in female skulls of *Spilogale ambigua*. In P^4 the anterior style is weak and the deutercone shelf is not so expanded anteroposteriorly as in Recent species of comparable size. The width of the tooth across the deutercone is also less. The molar is markedly less expanded anteroposteriorly through the lingual portion than in any of the recent material examined, although the length of the buccal portion is nearly equal to that in specimens of *S. ambigua*. The transverse width of the molar is comparable to that in the living form.

Comparison with other species of *Spilogale* described from the Pleistocene is limited to that with *Spilogale marylandensis* Gidley and Gazin²⁴ from Cumberland Cave. *Spilogale pedroensis* is readily distinguished from the Cumberland Cave form in exhibiting a much slenderer lower carnassial, particularly through the talonid portion. The longitudinal profile of the lower margin of the ramus, however, is similar in the two jaws, although the symphyseal portion is more abrupt in *S. marylandensis*. P_4 in *S. marylandensis* is more nearly oval in outline, as viewed from above, than in the Curtis ranch form.

Spilogale pedroensis is distinct from species of *Brachyprotoma* in the less crowded premolars, smaller and narrower P_4 , and in the relatively more elongate talonid and better developed metastylid on M_1 . M^1 in *Brachyprotoma pristina* Brown, as represented in Cumberland Cave, shows a more expanded lingual portion than in *S. pedroensis*.

²⁴ J. W. Gidley and C. L. Gazin, New Mammalia in the Pleistocene fauna from Cumberland Cave, Maryland. *Journ. Mamm.*, vol. 14, pp. 343-357 (351-352), figs. 1-9 (4), 1933.

although this portion of the tooth is not so developed as it is in the Recent species of *Spilogale*.

Measurements in millimeters of upper and lower teeth of Spilogale pedroensis

Measurement	No. 12869		No. 14682		No. 14683	
	P ⁴	M ¹	P ₄	M ₁	P ₄	M ₁
Anteroposterior diameter.....	5. 8	4. 5	3. 4	6. 8	3. 4	6. 2
Greatest transverse diameter.....	3. 4	6. 3	2. 0	2. 9	2. 0	¹ 2. 8

¹ Approximate.

FELIS sp., near FELIS LACUSTRIS Gazin

FIGURE 44

A relatively small cat, smaller than a modern puma but distinctly larger than a lynx, is represented by portions of a skeleton, No. 16618. These were found beneath the scapula of a mastodon and in close proximity to the skull of *Canis edwardii*. The material includes several vertebrae, a few foot bones and certain of the limb bones, among which are a complete humerus (fig. 44), femur and tibia.

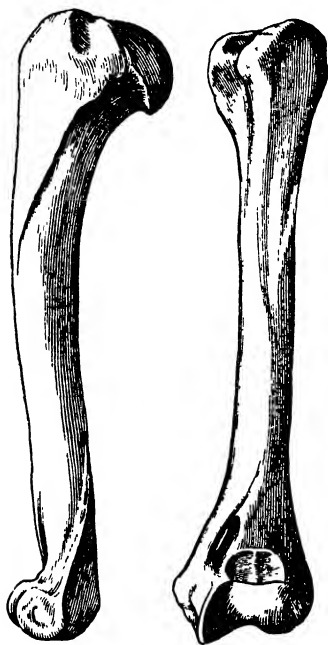


FIGURE 44.—*Felis* sp., near *F. lacustris* Gazin: Left humerus (U.S.N. M. No. 16618), lateral and anterior views. $\times \frac{1}{2}$. Curtis ranch Pleistocene, Arizona.

In the Pleistocene record there appears to be a dearth of cat material representing a form comparable to the smaller Curtis ranch type. The limb elements, however, compare favorably with those of *Felis lacustris*²⁵ from the earlier Hagerman lake beds of Idaho. The limb bones of the Hagerman skeleton, found subsequent to the description of *F. lacustris*, are for the most part incomplete, but the astragalus, the proximal and distal portions of the humerus and tibia, and the distal portion of the femur are nearly identical in proportions to those in the Curtis ranch cat. It should be noted, however, that the lower jaws associated with the Hagerman skeleton indicate an animal somewhat less robust than do the type specimen and certain other jaws referred to *F. lacustris*.

*Felis hillanus*²⁶ from the Blanco of Texas cannot be compared directly with the Curtis ranch form but the metacarpals in Cope's

²⁵ C. L. Gazin, Journ. Mamm., vol. 14, No. 3, pp. 251-254, 1933.

²⁶ E. D. Cope, 4th Ann. Rept. Geol. Surv. Texas, for 1892, pp. 55-57, 1893.

form are about the same length but not so slender as those in the Hagerman material. The second metatarsal in *F. hillanus* appears to be relatively small for a cat having a manus of the size indicated. The metatarsal as figured is much shorter than in *F. lacustris*.

FELIS sp., near FELIS ATROX Leidy

FIGURE 45

Included in the early Pleistocene material are an unassociated fourth lower premolar, calcaneum, and proximal portion of a third metatarsal, representing a cat of considerable size. The elements are much larger than those in modern puma and jaguar skeletons in the collections of the National Museum, and are of the true felid and not of the saber-tooth type. Comparison with material of *Felis atrox*, as described and figured by Stock,²⁷ shows the fourth premolar to be about equal in size to those somewhat smaller than average in specimens of *F. atrox*. The calcaneum and metatarsal have proportions of about two-thirds those of the maximum in *F. atrox*, being slightly smaller than the smallest indicated from Rancho La Brea. In this respect the large cat from the Curtis ranch horizon appears to be comparable to the form in the Cumberland Cave fauna, also considered as near *F. atrox*. The Cumberland Cave calcaneum, however, is somewhat more robust than that from Curtis ranch.

The lower premolar (fig. 45) is much larger than P₄ in a lower jaw from the Pleistocene of Florida referred to *Felis veronis*,²⁸ and consequently larger than would be expected in *Felis angustus*,²⁹ inasmuch as the upper carnassials in the types of these are of about the same size.

Order RODENTIA

CITELLUS COCHISEI Gidley

In the collection from Gidley's rodent locality is a right maxillary portion of a ground squirrel with all the cheek teeth, except for a part of P³. The upper dentition was made the type, No.



FIGURE 45.—*Felis* sp., near *F. atrox*, Leidy: Fourth lower premolar (U.S.N.M. No. 12865), lateral and occlusal views. $\times 1$. Curtis ranch Pleistocene, Arizona.

²⁷ J. C. Merriam and Chester Stock, Carnegie Inst. Washington Publ. 422, pp. i-xvi, 1-231, 1932.

²⁸ O. P. Hay, Proc. U. S. Nat. Mus., vol. 56, pp. 108-109, 1910.

²⁹ Joseph Leidy, Proc. Acad. Nat. Sci. Philadelphia, 1872, p. 39.

10490, of *Citellus cochisei*, and a left lower jaw, No. 10491, with the incisor and first two cheek teeth, was referred. A second lower jaw showing the alveoli for the cheek teeth and a portion of M_1 was added to the collection in 1936.

The teeth in *C. cochisei* differ from those of *C. bensoni* in being more compressed anteroposteriorly with more emphasis on the development of transverse crests such as in typical *Citellus* and *Cynomys* rather than as in *Otospermophilus*. The form is close in size to such species as *Citellus columbianus* of the Northwest and *Citellus eversmannii* of Siberia, larger than forms belonging to the subgenus *Itidomys*, common in Cochise County, Ariz., today.

The protocone in upper cheek teeth is not so compressed anteroposteriorly as in recent material belonging in the subgenus *Citellus*, but moderately so, such as in material of *Citellus mexicanus*, although the teeth are larger and relatively much wider than in this species. Moreover, as noted by Gidley, the valley between the protoloph and metaloph does not appear to extend so far lingually as in Recent *Citellus*, suggestive of *Cynomys* but with less development of the valley posterior to the metaloph; also, the teeth are more brachydont than in the Recent prairie dog.

Comparison of *C. cochisei* with *Citellus tuitus* Hay³⁰ from the early Pleistocene at Anita, Ariz. was not made by Gidley, but the differences between the forms were summarized by Howell³¹ in his revision of the North American ground squirrels: "Compared with *tuitus*, it [*C. cochisei*] differs in having the protocone of the upper molars stouter and less hypsodont; the metaloph on M^1 and M^2 is separated from the protocone by a wide sulcus; on M^3 the protoloph is likewise separated from the protocone by a wide sulcus; M^1 and M^2 are somewhat heavier than in *tuitus* but M^3 is relatively shorter." The separation of the protocone from the protoloph or metaloph in the upper teeth of *C. cochisei*, indicated in the foregoing statement, appears to be a condition entirely due to wear.

CF. *PEROGNATHUS* sp.

A lower jaw without cheek teeth, Amer. Mus. No. 27791, collected by Gidley at the Curtis ranch locality in 1924, was referred by Wood (1935 p. 107) to *Perognathus*.

DIPODOMYS GIDLEYI Wood

A species of *Dipodomys* in the Curtis ranch fauna was recognized by Wood (1935, pp. 156-159, fig. 74) on the basis of a right lower jaw, Amer. Mus. No. 21848, with cheek teeth P_4 to M_3 preserved but in a fragmentary condition. Among other characters it was noted that

³⁰ O. P. Hay, Proc. U. S. Nat. Mus., vol. 59, pp. 627-628, 1921.

³¹ A. H. Howell, North Amer. Fauna 56, pp. 215-216, 1938.

the anterior surface of P_4 is not grooved as in *P. ? minor* although this tooth is less worn than in the Benson jaw, and M_3 is not so reduced as in *P. ? minor*. There is no statement as to whether the teeth are rooted, but it is probable that they were not. Hence, it is possible that the Curtis ranch jaw, Amer. Mus. No. 27790, which Wood referred to *P. ? minor* may represent *D. gidleyi* or a closely related species. The two teeth in Amer. Mus. No. 27790 are well worn so that the absence of a groove on the anterior surface of P_4 is not significant.

DIPODOMYS sp.

The American Museum lower jaw, No. 27790 from Curtis ranch, which Wood (1935, pp. 155–156, fig. 73) referred to the Benson species, *P. minor*, includes P_4 and M_1 . These teeth are well worn, but M_1 is not rooted so that its representing the Benson species seems unlikely. Were the extent of individual variation in material of *D. gidleyi* known, it seems possible that this specimen might be shown to belong rather to *D. gidleyi*. The difference in pattern of P_4 in Amer. Mus. No. 27790 and Amer. Mus. No. 21848, the type of *D. gidleyi*, as illustrated can be attributed largely to difference in wear.

NERTEROGEOMYS,²² new genus

Generic characters.—Near *Geomys*, but P^4 exhibits enamel across the posterior wall and anterior column of P^4 , narrow, more as in *Thomomys*. Upper incisors grooved and anterior wall of lower molars without enamel as in *Geomys*. Mental foramen below anterior extremity of masseteric crest. Rostrum more depressed anteriorly with respect to plane of cheek teeth.

Genotype.—*Geomys persimilis* Hay.

NERTEROGEOMYS PERSIMILIS (Hay)

A small pocket gopher is represented in the Curtis ranch collection by the rostral portion of a skull, No. 10492, the type of *Nerterogeomys persimilis*, having all the cheek teeth except P^4 and M^3 of the right side. To this was referred a right lower jaw, No. 10493, with the first three cheek teeth. A more fragmentary lower jaw with only P_4 was added to the collection in 1936.

Nerterogeomys persimilis was originally described by Gidley as *Geomys parvidens*, but since this was preoccupied by *G. parvidens* Brown the name *G. persimilis* was proposed by Hay (1927, p. 136) for the Curtis ranch gopher.

²²*néprepos*, lower, below + *Geomys*, in allusion to its stratigraphic position.

The skull portion of *Nerterogeomys persimilis* is near that of *Geomys texensis* in size but with a shorter and somewhat shallower rostrum and the ventral surface anterior to the cheek teeth not extending so far above the plane of the cheek teeth. The upper incisors are slightly smaller but bisulcate as in *Geomys texensis*. The cheek teeth are also a little smaller and relatively narrower than in Recent *Geomys*. The anterior column of P⁴ is much narrower than in *Geomys* material, suggesting *Thomomys*, and the reentrants between the columns of this tooth are more open than in *Geomys*, though not so wide open as in *Thomomys*. Of particular interest is the presence of enamel across the posterior wall of P⁴ as in *Thomomys*, but not *Geomys*. According to Merriam³³ enamel occurs on a portion of the posterior wall of this tooth in the Mexican and Central American forms *Heterogeomys*, *Macrogeomys*, *Zygogeomys*, and some *Orthogeomys*. Enamel was also noted on the posterior wall of P⁴ in *Plesiothomomys ? orientalis* (Simpson)³⁴ from the Pleistocene of Florida, and as in *N. persimilis* the rostral portion of *P. ? orientalis* was observed to be somewhat depressed.

The lower jaw of *N. persimilis* appears to be more robust than that of *N. ? minor*, and the masseteric ridge is much better defined, but as in that species the mental foramen is situated below the anterior extremity of the masseteric crest rather than in front of it as in modern *Geomys* and *Thomomys*. The lower cheek teeth in *N. persimilis* are small and relatively narrow as in *N. ? minor* but the anterior column of P₄ appears smaller and more nearly circular in outline. The anterior surface of the lower molars is without enamel, comparable in this respect with *Geomys* and differing from *Thomomys* and *Plesiothomomys*.

BAIOMYS BRACHYGNATHUS (Gidley)

The type and only specimen of this species is a right lower jaw, No. 10501, with all the teeth present and well worn. The form seems most nearly comparable to *Baiomys taylori* as indicated by Gidley, but with a more reduced last lower molar. The last molar is reduced in material of *Reithrodontomys* as well as *Onychomys*, and although the form seems clearly distinct from *Onychomys* the differences from *Reithrodontomys* are not so obvious.

Jaws of *Reithrodontomys megalotis* are comparable in size to those of *Baiomys taylori* but with a somewhat more reduced last lower molar and slightly better developed anterior portion of the first lower cheek tooth, with the anterior pair of cusps more sharply separated from the second pair lingually. Also, the lower incisor is more curved or

³³ C. H. Merriam, North Amer. Fauna 8, p. 79, 1895.

³⁴ G. G. Simpson, Amer. Mus. Nov., No. 328, pp. 6-7, 1928. See also J. W. Gidley and C. L. Gazin, U. S. Nat. Mus. Bull. 171, p. 59, 1938.

less procumbent in *R. megalotis* than in *B. taylori*, and with the depth of the jaw below the first tooth somewhat greater to accommodate an incisor of greater curvature. Moreover, the coronoid process is smaller.

In the Curtis ranch jaw the last tooth is reduced much as in *R. megalotis* but the anterior portion of the first lower cheek tooth more nearly resembles that in *Baiomys*, and although the teeth show considerable wear, the anterior portion of the first seems to be somewhat shorter than in either form. The length of the anterior portion of the lower jaw, a character stressed by Gidley, cannot be certainly determined because the bone is partially broken away from around the incisor. The beveled portion of the incisor is much closer to the cheek teeth than in other forms but this may have been brought about by a backward sliding of the incisor, since the posterior end of the incisor is not now covered, although the tooth seems quite secure at the present time. In spite of this, the incisor is definitely more procumbent than in *Reithrodontomys* and slightly more so than in *Baiomys taylori*. The lower margin of the fossil jaw is not entire across the incisor below the first cheek tooth and the coronoid process is not preserved.

ONYCHOMYS PEDROENSIS Gidley

The Curtis ranch *Onychomys* is now represented by eight jaw portions, including two that were obtained in 1936; however, none have more than two cheek teeth, and in only one is the incisor complete. The type is a left lower jaw, No. 10506, with an incomplete incisor and the first and third cheek teeth.

The jaws are noticeably deeper and more robust than in *Onychomys leucogaster ruidosae* and the teeth a little larger, much larger than in *O. bensoni*. Structurally, the teeth are very close to those in *O. l. ruidosae*, and relatively higher crowned than in *O. bensoni*. The masseteric ridge, as indicated by Gidley, extends farther forward than in the Recent form and the last cheek tooth is less reduced; the talonid portion, however, is more restricted than in *O. bensoni*.

SIGMODON CURTISI Gidley

In addition to the type, No. 10510, which includes both rami of the mandible with all the cheek teeth and a nearly complete incisor on the right, the large Curtis ranch *Sigmodon* is represented by three lower portions with two to three cheek teeth each and a left maxillary fragment with all the cheek teeth. The upper dentition and two of the lower jaws were added to the collection in 1936.

Sigmodon curtisi is a heavy jawed form distinctly larger than *S. medius* of the Benson fauna, comparing favorably in size of teeth with the modern cotton rat, *Sigmodon hispidus*. The anterior lobe of

the first lower cheek tooth is relatively wider than in *S. medius*, resembling the modern form in this respect. Gidley noted that the cheek teeth were less hypsodont than in the living species, that the valleys of the reentrant folds were more widely open and the lophs more compressed. Although these characters are evident, the extent to which they are exhibited is not so noticeable as in *S. medius*. As in *S. medius* the posterior reentrant on the lingual side of the second tooth is much deeper than in Recent *Sigmodon* and the posterior portion of the lingual wall of the third tooth makes a sharp right angle with the enamel of the lingual reentrant; however, the lingual wall of this tooth does not appear to be notched as it is, though weakly so, in the type of *S. medius*.

The upper dentition added to the collection in 1936 is in an early stage of wear, and the teeth appear noticeably more hypsodont than the upper teeth belonging to the type of *S. medius*. In this respect they approach more closely teeth in modern species, although the reentrant valleys appear more widely open than in these. The anterior lobe of the first upper cheek tooth, unlike that in the lower dentition of *S. curtisi*, is narrower than in modern material observed, approaching more closely the relative proportions seen in *S. medius*. The upper teeth of *S. curtisi* are otherwise similar to those in the modern cotton rat, particularly *S. sanctae martae* of Colombia.

SIGMODON MINOR Gidley

A small species of *Sigmodon* is represented in the Pleistocene collection by no less than ten lower jaws and a maxillary portion. Four of the lower jaws were obtained by the 1936 expedition. The type, a left ramus, No. 10512, and seven of the referred jaws include all the cheek teeth.

Sigmodon minor is considerably smaller than its contemporary, *Sigmodon curtisi*, but less widely separated from the earlier *S. medius*. There is an appreciable variation in the size of the jaws and teeth, and although size of teeth is not in every case correlated with size of jaw, one heavy jawed specimen, No. 16611, has slightly larger teeth than the smallest of the Benson lot; however, the average of the teeth is distinctly less and all of the *S. minor* jaws exhibit relatively narrower teeth than in *S. medius*. The degree of hypsodonty and the pattern of the lower teeth of *S. minor* correspond closely to those in *S. medius* and the two forms differ in nearly the same respects from the living species.

The upper teeth in No. 10513 are also smaller than those belonging to the type of *S. medius*, and the anterior lobe of the first is a little narrower, as noted in several, but not all, of the lower dentitions. Gidley noted also that the external reentrants in the first upper tooth

were of the normal modern type. The difference from *S. medius* in this respect is not obvious as the teeth in No. 10513 show very little wear and are fractured, hence not easily compared with those of the *S. medius* specimen.

ONDATRA sp.

A second left upper molar in the Curtis ranch collection was referred by Gidley to *Neofiber*, probably because of its small size, but since the enamel folds terminate at the lower end, with the formation of small pockets, suggesting a rooted type of tooth, the specimen probably represents a form of *Ondatra*. The tooth is nearly as small as that in *Ondatra idahoensis*²⁵ material from the late Pliocene of Idaho, but appears to be a little more hypsodont.

A poorly preserved lower jaw, including a portion of the second cheek tooth was found at the Curtis ranch locality in 1936. Except for its smaller size the specimen resembles jaws of *Ondatra zibethica*; however, the jaw seems relatively shallow and the anterior margin of the ascending ramus extends forward as a ridge to a point nearer the anterior end of the tooth row.

Order LAGOMORPHA

LEPUS sp., near LEPUS CALIFORNICUS Gray

A portion of the right mandibular ramus, U.S.N.M. No. 16619, including P_3 to M_1 , collected in 1936, is from a lagomorph very near *Lepus californicus eremicus* in size and proportions of the teeth. The anterior wall of the posterior column of the lower cheek teeth seems somewhat more crenulated than in the modern form. P_3 appears relatively broad posteriorly and does not exhibit so flattened a lingual wall.

Cf. SYLVILAGUS sp., near SYLVILAGUS FLORIDANUS (Allen)

A fragmentary right ramus of the mandible with P_3 and P_4 , No. 10528, which Gidley referred to as Species No. 3 and compared with *Lepus californicus eremicus*, is relatively small and more nearly resembles material belonging to *Sylvilagus floridanus*. P_3 in this specimen exhibits an unusually deep fold from the middle of the posterior wall of the anterior column forward into the anterior column, more pronounced than shown in Gidley's figure of this specimen (1922, fig. 13).

²⁵ R. W. Wilson, Carnegie Inst. Washington Publ. No. 440, pp. 132-135, 1933.

Order PROBOSCIDEA

STEGOMASTODON ARIZONAE Gidley

Stegomastodon arizonae has for a type the greater part of a skeleton, No. 10707, including the basal portion of the skull with both tusks and the cheek teeth. To this were referred two other skeletal portions. One of these is of an older individual, No. 10556, and includes the basal portion of the skull with the cheek teeth and tusks, and the lower jaws as well as other portions of the skeleton. The third specimen, No. 10917, includes only a portion of a hind limb and an associated lower jaw without teeth.

Both Gidley (1926, pp. 86-91) and Osborn (1936, pp. 678-682) have given appreciable space to the description and discussion of this material. The form is clearly of the stegomastodont type and on the basis of the lower molars appears, as indicated by Gidley and Osborn, to be more progressive than the type of *Stegomastodon mirificus*. Osborn further notes that the third lower molar with seven and a fraction crests is also somewhat more progressive than that in *Stegomastodon texanus* of the Blanco beds, but less progressive than the *S. aftoniae* type from Iowa.

Order PERISSODACTYLA

EQUUS sp.

The Curtis ranch collection includes a number of isolated upper and lower cheek teeth, portions of jaws, foot bones and fragments of limb bones belonging to *Equus*. The form represented is not of great size, comparing favorably in this respect with material of *Equus semiplicatus* Cope from Texas or *Equus laurentius* Hay from Hay Springs, Nebr. I hesitate to refer the Curtis ranch material to any one of the numerous species of Pleistocene horses because of the great need for revision in this group and also because I regard the stage represented at Curtis ranch as somewhat earlier than the Pleistocene horizons represented at Rock Creek, Tex., and Hay Springs, Nebr. A few comparisons, however, are made with specimens representing certain of the forms which have been named.

The upper molars compare favorably with the dimensions given by Cope⁸⁶ for *E. semiplicatus*, to which species the Curtis ranch material may belong, although the protocone in the Arizona teeth is not so elongate as in *E. semiplicatus*. The size of the protocone is noticeable in both Cope's⁸⁷ and Gidley's⁸⁸ figures of the San Diego, Tex., skull referred by Gidley to *E. semiplicatus*.

⁸⁶ E. D. Cope, 4th Ann. Rept. Geol. Surv. Texas, for 1892, p. 80, 1893.

⁸⁷ E. D. Cope, *ibid.*, pl. 22, fig. 3.

⁸⁸ J. W. Gidley, Bull. Amer. Mus. Nat. Hist., vol. 14, pp. 129-130, fig. 21, 1901.

Horse teeth found in deposits at Pleistocene Lake Cochise, not far from the San Pedro Valley, were regarded by Gidley³⁹ as representing three species. I doubt, however, that more than one is represented and this may well be *Equus pacificus* or a large *E. occidentalis*. These specimens average much larger than the teeth from Curtis ranch, and the Pleistocene stage represented may be much later.

The Curtis ranch teeth do not differ appreciably in size from material Hay⁴⁰ described as *Equus laurentius* from Hay Springs, Nebr., although the patterns exhibited are not much alike. The Curtis ranch upper teeth have somewhat more concave walls between the outer styles and the enamel plates in the walls and lakes are in general either more arcuate or trend somewhat more oblique than in the Hay Springs paratype. Typical *E. laurentius*, and in particular *E. nevadensis* from Manhattan, Nev., make a marked approach to the type of teeth seen in *E. caballus*. The Curtis ranch teeth, though clearly of the *Equus* type, do not seem to be so far removed from the *Plesippus* stage as does much of the better known Pleistocene material.

A few upper teeth, apparently from one individual, No. 11597, found near a powder mill a couple of miles south of the Benson locality seem to represent *Equus* rather than *Plesippus* and may be from the Curtis ranch level although the occurrence is geographically nearer to the Benson locality. These teeth are of about the same size and show somewhat the same type of enamel pattern seen in upper teeth from Curtis ranch proper.

Order ARTIODACTYLA

Camelid sp.

A camel of considerable size is present also in the Curtis ranch fauna. The material representing this form consists of a right maxillary portion, No. 12870, with P³ to M³, and the proximal and distal portions of a fused radius and ulna. P² is lacking in the dental formula of this animal, as was probably true of the Benson dentition, also the cheek teeth are very similar to those in the older form, but appear a little larger. The difference in size may be due principally to the greater wear suffered by the Benson teeth. In the Curtis ranch specimen the teeth are not in an early stage of wear, nevertheless the length of the series including P³ to M³ is seen to be about 200 mm. This is estimated because M³ is not complete posteriorly.

The dentition in No. 12870 is comparable in size to that indicated for *Gigantocamelus fricki* Barbour and Schultz⁴¹ from Lisco, Nebr.,

³⁹ Kirk Bryan and J. W. Gidley, Amer. Journ. Sci., vol. 11, pp. 481-484, 1926.

⁴⁰ O. P. Hay, Proc. U. S. Nat. Mus., vol. 44, pp. 584-591, fig. 27, 1913.

⁴¹ E. H. Barbour and C. B. Schultz, Bull. Univ. Nebraska State Mus., vol. 2, No. 2, p. 21, 1939.

and probably to that of *Megatylopus? spatula* (Cope)⁴² from the Blanco formation, as well as to the larger of the teeth from Hay Springs, Nebr., and American Falls, Idaho, referred to species of *Camelops*.

A camel of marked size, though possibly not so large as the Curtis ranch form, was described by Hay⁴³ as *Procamelus coconinensis* from Anita, Ariz., a Pleistocene occurrence of relatively early date as indicated by the association of *Hypolagus*. The material of the camel is very fragmentary and I am uncertain as to whether this form should be referred to *Camelops* or to the *Megatylopus-Paracamelus* group, probably the latter. The type of the large Anita camel, the greater portion of an upper molar, is rather well worn, and, in addition to being a little smaller than teeth in the larger San Pedro Valley camels, shows much more acute external styles, particularly that on the outer wall of the anterior lobe between the parastyle and mesostyle. Foot bones in the Anita collection, however, indicate some individuals of very considerable size, so that were adequate material known it might be shown that the Curtis ranch or possibly the Benson form could not be distinguished from that occurring at Anita.

TANUPOLAMA cf. LONGURIO (Hay)

FIGURE 46

In addition to the giant type of camel there is in the Curtis ranch fauna a representative of the llamalike group, *Tanupolama* Stock.⁴⁴ The material includes portions of the right and left ramus of the mandible, No. 10636, with a representation of nearly all the teeth. There are also fragments of the jaws and right maxilla of a second and immature individual, No. 10635, with poorly preserved teeth.

The more mature lower jaw (fig. 46) exhibits the first and second incisor, the alveolus for I_3 , an erupting canine, and P_4 to M_3 . P_2 and P_3 are missing from the formula but the caniniform P_1 with its posteriorly directed hook was found unemerged in the jaw. The first of the cheek tooth series, undoubtedly P_4 , is seen in both right and left mandibular portions. The tooth is relatively small but noticeably hypsodont and not sharply constricted anteriorly. This tooth is partially broken down in both rami so that the character of its crown is not entirely evident. There is a shallow fold on the posterior portion of the outer wall, giving the tooth a slightly bilobed appearance; a sharp enamel reentrant is seen on the anterior portion of the lingual wall, disappearing downward, however; and at the stage of wear represented a prominent enamel fold extends forward from the pos-

⁴² E. D. Cope, 4th Ann. Rept. Geol. Surv. Texas, for 1892, pp. 70-73, pl. 21, figs. 1-2, 1893.

⁴³ O. P. Hay, Proc. U. S. Nat. Mus., vol. 59, pp. 622-624, pl. 122, figs. 4-6, pl. 123, fig. 5, 1921.

⁴⁴ Chester Stock, Carnegie Inst. Washington Publ. 393, pp. 29-37, pls. 1-6, 1928.

terior wall. The molars have the characteristic anteroexternal styles, and on M_3 a marked style extends lingually from the anterointernal angle of the tooth.

The species *Tanupolama longurio* was described by Hay⁴⁵ in 1921 as a species of *Procamelus* from the Pleistocene fissure deposit at

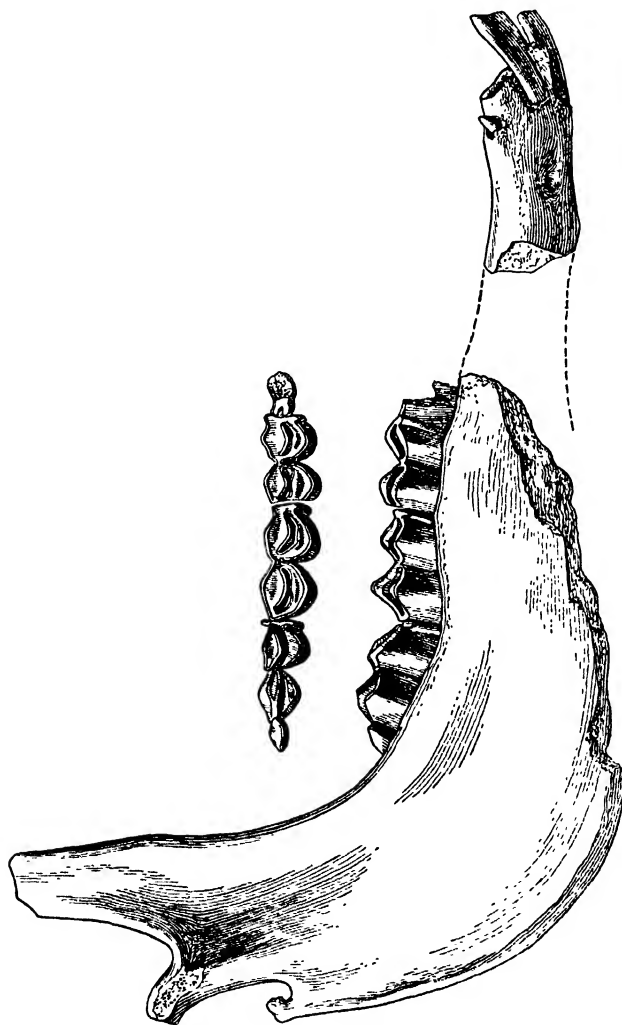


FIGURE 46.—*Tanupolama* cf. *longurio* (Hay): Right ramus of mandible (U.S.N.M. No. 10636), lateral and occlusal views. $\times \frac{1}{4}$. Length of anterior portion determined from left ramus. Curtis ranch Pleistocene, Arizona.

Anita, Ariz. From his description and from an examination of the material it is evident that a species of *Tanupolama* is represented. The material described by Hay did not include skull or jaw remains but the cervical vertebra and foot material indicate a llama-like animal with long and slender neck vertebrae and long, slender limbs

⁴⁵ O. P. Hay, Proc. U. S. Nat. Mus., vol. 59, pp. 624–626, pl. 120, fig. 8; pl. 123, figs. 3–4; pl. 124, fig. 4, 1921.

and feet, entirely comparable with characters indicated for *Tanupolama*. The type, U.S.N.M. No. 10166, an incomplete posterior cannon bone, measures about 44 by 40 mm. at the proximal end, a somewhat smaller diameter than the figures given by Stock for *T. stevensi*, and the incomplete length is about 290 mm., approximately two-thirds the entire bone. The distal portion of a radius-ulna is also seen to be of slightly less diameter than this element in *T. stevensi* as measured by Stock. A number of foot bones in the Anita collection represent *T. longurio*; however, two broken portions of the distal end of a cannon bone, No. 10174, which Hay indicated as belonging to this species, probably belong to the larger camel in the fauna.

Compared with material of *Tanupolama stevensi* (Merriam and Stock)⁴⁶ the fourth premolar in the Curtis ranch specimen appears slightly smaller but the molars are seen to be appreciably longer anteroposteriorly and relatively narrower than those for which dimensions are given. Although the anteroposterior length of the occlusal surface of the teeth would change appreciably with wear, possibly not enough to account for the difference in size of teeth between the Curtis ranch form and that from McKittrick tar pits. The lingual walls of these teeth though moderately smooth appear less so than in *T. stevensi* and the anterointernal style on M_3 seems more outstanding than in the figured material of *T. stevensi*. Another character noted, but possibly not of importance, is the higher position of the process of the angle on the posterior border of the ramus from Curtis ranch. *Tanupolama stevensi* is probably distinct from *T. longurio*, as the remoteness of the late Pleistocene stage at McKittrick from the earlier horizons at Curtis ranch and Anita would suggest, even though the geographic separation is not great.

The type of *Tanupolama americana* (Wortman)⁴⁷ from the Pleistocene at Hay Springs, Nebr., a stage also later than that at Curtis ranch, has an apparently shorter cheek tooth series and the portion of the jaw anterior to P_4 seems significantly longer than in the Curtis ranch jaw, although these differences could be accounted for in part by the difference in maturity between the two individuals. In 1929 Frick⁴⁸ proposed the name *Prochenia* for Wortman's species, but this must be regarded as a synonym of *Tanupolama*.

The type lower teeth of *Tanupolama mirifica* Simpson⁴⁹ from the Seminole field in Florida are in nearly the same stage of wear as those in the Curtis ranch jaw but measure a little shorter anteroposte-

⁴⁶ J. C. Merriam and Chester Stock, Carnegie Inst. Washington Publ. 347, pp. 37-42, figs. 1-4, 1925.

⁴⁷ J. L. Wortman, Bull. Amer. Mus. Nat. Hist., vol. 10, art. 7, pp. 133-134, fig. 21, 1898.

⁴⁸ Childs Frick, Nat. Hist., vol. 29, p. 107, 1929.

⁴⁹ G. G. Simpson, Bull. Amer. Mus. Nat. Hist., vol. 56, art. 8, pp. 593-596, figs. 17-19, 1929.

riorly and the anteroexternal styles are less developed, as is the style on the anterointernal angle of M_3 of the Florida dentition.

Cf. CAPROMERYX GIDLEYI Frick

FIGURE 47

A right maxillary portion, No. 12873, with incomplete second and third molars, and a portion of a right lower jaw, No. 12874, with M_1 to M_3 , were referred by Gidley to *Merycodus*. As with the Benson teeth, those in the Curtis ranch jaws are recognized as of an antilocaprid type. Unfortunately none of the premolars are preserved and the molars in both specimens are badly broken down, but those in the lower jaw are approximately of the size and hypsodonty seen in the type of *Capromeryx furcifer* figured by Matthew.⁵⁰

Frick (1937, p. 529) proposed the name *Capromeryx gidleyi* for an antilocaprid represented in his collection from Curtis ranch by an incomplete horn core. This he considered as of the *Capromeryx* type; however, as pointed out by Hesse⁵¹ and by Stirton⁵² the type of horn core possessed by true *Capromeryx* remains somewhat in doubt. The jaw fragments in the National Museum collection may well represent the same form of antilocaprid as that indicated by the horn core, although this is uncertain.

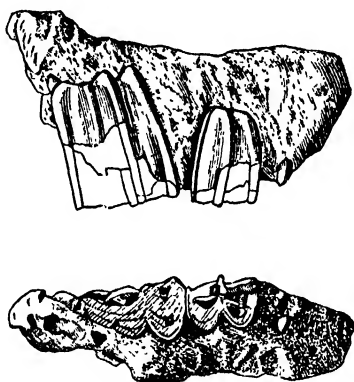


FIGURE 47.—Cf. *Capromeryx gidleyi* Frick: Right maxillary portion (U.S. N.M. No. 12873), lateral and occlusal views. $\times \frac{3}{4}$. Curtis ranch Pleistocene, Arizona.

Cf. ODOCOILEUS sp.

Remains of a large deer in the Curtis ranch collection include a right lower jaw portion, No. 12872, with Dp_2 – Dp_4 and M_1 – M_2 , fragments of the jaw of a second individual with P_4 and M_1 , limb fragments and portions of antlers. Structurally the material closely resembles that of *Odocoileus*, but some of it is a little larger and more robust than corresponding material of particularly large individuals of both black-tailed deer, as represented in Colorado, and the white-tailed deer of North Dakota. The teeth in the Curtis ranch form in addition to their larger size appear to be slightly more hypsodont and the styles between the outer lobes of M_1 and Dp_4 more sturdy than

⁵⁰ W. D. Matthew, Bull. Amer. Mus. Nat. Hist., vol. 20, art. 7, pp. 126–127, fig. 20, 1904.

⁵¹ C. J. Hesse, Journ. Mamm., vol. 16, No. 4, pp. S07–S15, 1935.

⁵² R. A. Stirton, Journ. Mamm., vol. 19, No. 3, pp. 866–870, 1938.

in the recent deer; also, P_4 is noticeably large and the talonid portion relatively broad. The portions of antlers, though in part robust, are comparable structurally to those in modern individuals of either *Odocoileus* or *Eucervus*, but not complete enough to attempt a closer comparison to one or the other of these subgroups.

The Curtis ranch deer is probably not greatly different in size from that which Hay⁵⁸ described as *Sangamona fugitiva*, although there are no upper teeth in the Curtis ranch collection with which comparisons may be made. The lower teeth in the Curtis ranch jaws appear larger than in the illustrations of the forms which Frick (1937, pp. 191-202, fig. 20) described as *Odocoileus sheridanus* from Nebraska, or the earlier *Procoileus edensis* from Eden, Calif. The character of P_4 as illustrated for the Eden form is noticeably different than that in the Curtis ranch material.

⁵⁸ O. P. Hay, Proc. U. S. Nat. Mus., vol. 58, pp. 91-92, pl. 3, figs. 14-15, 1920.



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THE TYPE SPECIES OF THE GENERA AND SUBGENERA OF BEES

By GRACE A. SANDHOUSE¹

INTRODUCTION

This paper² lists the genera and subgenera of the bees (superfamily Apoidea) and in each case cites what is considered to be the earliest correct genotype designation. Dalla Torre's Catalogus Hymenopterorum, the Zoological Record, and a card catalog of genera and species in the United States National Museum served as a basis for the preparation of this work. Emendations and some *lapsi* have been included, but not all the typographical errors. *Nomina nuda* are also recorded in order that possible uncertainty concerning the status of such names may be removed.

The first generic name to be proposed for a group of bees was *Apis* Linnaeus, 1758. By 1800 only 4 other names had been added: *Eucera* and *Nomada* Scopoli, 1770; *Andrena* Fabricius, 1775; and *Hylaeus* Fabricius, 1793. Beginning with 1800, however, the number of gen-

¹ Died on November 9, 1940.

² Although Miss Sandhouse had prepared the first draft of the manuscript before her death, she had no opportunity to review it critically and to put it into final form. P. W. Oman and I have attempted to do this. In the treatment of the names belonging in the Osmiinae and in the Bomblidae we have been appreciably assisted by C. D. Michener and Dr. T. H. Frison, respectively, and this aid is gratefully acknowledged. In accord with the practice followed in other lists of this kind a genus containing only one specific name treated as valid is regarded as monobasic, although one or more synonyms may have been listed by the author of the generic name. Exceptions have been made, however, in the case of *Abrupta* Méhely, and of *Fasciata* Méhely, two names proposed since December 31, 1930, when Article 25c of the International Rules became effective.—C. F. W. Muesebeck, Division of Insect Identification, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

eric and subgeneric names increased rapidly. Fifty-nine genera were established from 1800 to 1810 inclusive; 28 genera and 1 subgenus from 1811 to 1840, inclusive; 191 genera and 60 subgenera from 1841 through 1899; and 281 genera and 103 subgenera from 1900 through 1938.

As is frequently true in an undertaking of this kind, the current interpretations of some well-known genera have been found to require modification. An attempt has been made to adhere strictly to the rules and opinions of the International Commission on Zoological Nomenclature, and reference is made to the rules or opinions on which the conclusions are based in the discussions under some of the genera. Recently some proposals for the suspension of the Rules of Nomenclature with reference to generic names in the bees have been submitted to the International Commission, and these are also mentioned under the names which would be affected. However, such proposals cannot be accepted until opinions on them have been rendered and published.

The names of Jurine's genera that appeared in the "Erlangen List"^a have recently been invalidated by Opinion 135 of the International Commission. The genotype designations of Latreille (1810) are considered valid by the International Commission (Opinion 11). *Megachile*, *Centris*, and *Anthophora*, however, were cited by Latreille with more than one species included under each and consequently cannot be regarded as having received type fixation in that publication (Opinion 36).

The necessity for a definite genotype designation for each genus or subgenus has been accepted by most systematic entomologists, and at its meeting in Budapest in 1927 the International Zoological Congress passed an amendment to Article 25 (law of priority) according to which a genus proposed after December 31, 1930, without a definite unambiguous designation of the type species, is to be considered as invalid under the Rules. Fortunately only a few names in the list that follows are affected by this ruling.

The terminology used in the present list is essentially that contained in Article 30 of the International Rules with the following exceptions: *Monobasic* is here used instead of *monotypic*, and *isogenotypic* is used in reference to two or more genera that have the same species as genotype.

The original work covered by each citation has been consulted, unless a statement to the contrary follows the reference. The dates of publication given by Sherborn in his *Index Animalium* have been used for most of the names published before 1850. These, in most in-

^a Erlangen Litteratur-Zeitung, vol. 1, p. 164, 1801.

stances, are in agreement with those given in *Nomenclator Animalium Genera et Subgenera*, published by the Preussische Akademie der Wissenschaften in Berlin (not yet complete), and Neave's *Nomenclator Zoologicus*, the final volume of which appeared in 1940. It should be noted, however, that the latter cites 1805 instead of 1804 as the date of publication of Fabricius' *Systema Piezatorum*, in agreement with the conclusions published by Richards.⁴

In arrangement this catalog follows rather closely that adopted by Rohwer, Viereck, and Gahan and Fagan in earlier genotype catalogs of other groups of Hymenoptera. The generic and subgeneric names are listed alphabetically with reference to the original description; and, if no species was originally included, the citation to the work in which the first species was assigned is given also. The number of species originally included is shown except in the case of monobasic genera. In each case mention of the genotype is followed by the date of original description and by an indication of the character and place of type fixation. If the genotype is considered to be a synonym, the name is enclosed in parentheses and is followed by the name of the valid species. Erroneous type designations are mentioned, together with reasons for considering them invalid.

ALPHABETICAL LIST OF GENERIC AND SUBGENERIC NAMES *

Abda, new name (= *Anthedon* ROBERTSON, 1900, not AGASSIZ, 1846).

Type.—*Melissodes compta* CRESSON, 1878. (Autobasic.)

Abrupta MÉHELY.

Naturgeschichte der Urbienen, pp. 32 and 137, 1935. Two names.

Proposed as a subgenus of *Prosopis* Fabricius.

Invalid under Article 25c of the International Rules of Zoological Nomenclature, since no genotype was designated.

Abrupta POPOV.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 167, 1939.

Type.—(*Hylaeus*) *Prosopis cornuta* (F. SMITH), 1842. (Monobasic and original designation.)

Acamptopoeum COCKERELL.

Trans. Amer. Ent. Soc., vol. 31, p. 320, 1905.

Type.—*Camptopoeum trifasciatum* SPINOLA, 1851. (Monobasic and original designation.)

Acanthalictus COCKERELL.

Ann. Mag. Nat. Hist., ser. 9, vol. 14, p. 184, 1924. Two species.

Type.—*Halictus dybowskii* RADOSZKOWSKI, 1877. (Original designation.)

Acanthopus KLUG.

Magazin für Insektenkunde, vol. 6, pp. 190 and 226, 1807.

Type.—(*Apis*) *Xylocopa splendida* (FABRICIUS), 1793. (Monobasic.)

⁴ Trans. Roy. Ent. Soc. London, vol. 83, p. 144, 1935.

* This list is believed to be complete for the literature through 1938, and some names that appeared in 1939 are included.

Acanthosmia THOMSON.

Hymenoptera Scandinaviae, vol. 2, pp. 233 and 252, 1872. No species.

SCHMIEDEKNECHT, in *Apidae Europaeae*, vol. 2, p. 20 [1886], 1884-86 [1885]. Fifteen species.

Type.—*Osmia montivaga* MORAWITZ, 1872 (= *Osmia mitis* THOMSON, 1872, not NYLANDER, 1852). (Present designation.)

Proposed as a subgenus of *Osmia* Panzer.

(*Acanthosmiades* TITUS) for *Acanthosmioides* ASHMEAD.

Proc. Ent. Soc. Washington, vol. 6, p. 101, 1904.

Acanthosmioides ASHMEAD (= *Acanthosmiades* TITUS).

Trans. Amer. Ent. Soc., vol. 28, p. 76, 1899.

Type.—*Osmia odontogaster* COCKERELL, 1897. (Monobasic and original designation.)

Acentron MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 303, 305, and 307, 1934. Five species. *

Type.—*Megachile albitarsis* CRESSON, 1872. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Aceratosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, p. 19 [1885], 1884-86 [1885]. Two species.

Type.—*Osmia emarginata* LEPELETIER, 1841. (By designation of Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 9, 1939.)

Proposed as a subgenus of *Osmia* Panzer.

Synonym of *Osmia* Panzer, according to Sandhouse (loc. cit., p. 9).

Acunomia COCKERELL.

Amer. Mus. Novitates, no. 433, p. 11, 1930. Three species.

Type.—*Nomia nortoni* CRESSON, 1868. (Original designation.)

Proposed as a subgenus of *Nomia* Latreille, or of *Paranomia* Friese.

Adventoribombus SKORIKOV.

Bull. Sta. Région, Protect. Plantes Petrograd, vol. 4, p. 150, 1922. Twenty-four species.

Type.—*Agrobombus* (*Adventoribombus*) *adventor* SKORIKOV, 1922. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Agrobombus* Vogt.

Afrostellis COCKERELL.

Rev. Zool. Bot. Africaines, vol. 20, p. 340, 1931. Three species.

Type.—*Afrostellis tegularis* COCKERELL, 1931. (Original designation.)

Agapostemon GUÉRIN.

Iconographie du Règne animal de G. Cuvier., vol. 7, Insects, vol. 3, p. 448, 1844.

Type.—*Apis* (*Andrena*) *femoralis* GUÉRIN, 1844. (Monobasic.)

Proposed as a subgenus of *Andrena* Fabricius.

(*Aglaa* SCHULZ) for *Aglae* LEPELETIER AND SERVILLE.

Spolia Hymenopterologica, p. 258, 1906.

Aglae LEPELETIER AND SERVILLE (= *Aglaa* SCHULZ).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 105, 1825.

Type.—*Aglae coerulea* LEPELETIER AND SERVILLE, 1825. (Monobasic.)

Aglaoapis CAMERON.

Entomologist, vol. 34, p. 262, 1901.

Type.—*Aglaoapis brevipennis* CAMERON, 1901. (Monobasic.)

Synonym of *Dioxya* Lepeletier and Serville, according to Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 12, p. 496, 1913.

Agrobombus Vogt.

Sitz-Ber. Ges. naturf. Freunde Berlin, p. 52, 1911. Seven species.

Type.—(*Apis*) *Bombus agrorum* (FABRICIUS), 1787, not SCHRANK, 1781.

(Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Apis agrorum Fabricius, 1787, is preoccupied by *Apis agrorum* Schrank, 1781, but Richards, The generic names of British insects, pt. 5, p. 94, 1937, has proposed the retention of *agrorum* Fabricius under suspension of the law of priority.

Alcidamea CRESSON.

Proc. Ent. Soc. Philadelphia, vol. 2, p. 385, 1864. Two species.

Type.—*Alcidamea producta* CRESSON, 1864. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 158, 1941.)

(**Alfkenella** BÖRNER) = **Amegilla** FRIESE.

Biol. Zentralblatt, vol. 39, p. 168, 1919. Four species.

Type.—(*Apis*) *Podalirius quadrifasciatus* (VILLERS), 1789. (Original designation.)

Isogenotypic with *Amegilla* Friese.

(**Allodapa** SCHULZ) for **Allodape** LEPELETIER AND SERVILLE.

Spolia Hymenopterologica, p. 244, 1906.

Allodape LEPELETIER AND SERVILLE (= **Allodapa** SCHULZ).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 18, 1825.

Type.—*Allodape rufogastra* LEPELETIER AND SERVILLE, 1825. (Monobasic.)

Allodapula COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 14, pp. 220 and 237, 1934. Eight species.

Type.—*Allodape variegata* F. SMITH, 1854. (Original designation.)

Proposed as a subgenus of *Allodape* Lepeletier and Serville.

Alloperdita VIERECK.

Bull. Amer. Mus. Nat. Hist., vol. 37, p. 241, 1917.

Type.—*Perdita (Alloperdita) novaeangliae* VIERECK, 1917. (Monobasic.)

Proposed as a subgenus of *Perdita* F. Smith.

Allopsithyrus POPOV.

Eos, vol. 7, p. 136, 1931. Two species.

Type.—(*Apis*) *Psithyrus barbutellus* (KIRBY), 1802. (Original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Alloscirtetica HOLMBERG (= **Scirtetica** HOLMBERG, 1903, not SAUSSURE, 1884;

Neoscirtetica SCHROTTKY; **Holmbergiapis** COCKERELL).

Apuntes Historia Natural, Buenos Aires, vol. 1, p. 77, 1909.

Type.—*Scirtetica antarctica* HOLMBERG, 1909. (Autobasic.)

Neoscirtetica and *Holmbergiapis* were also proposed to replace *Scirtetica* Holmberg, preoccupied.

Alloxylocopa MA.

Lingnan Sci. Journ., vol. 18, p. 155, 1939. (?Original reference.)

Type.—*Xylocopa appendiculata* F. SMITH, 1852. (Monobasic and original designation?)

Proposed as a subgenus of *Xylocopa* Latreille.

Alphaneura WESTWOOD (= **Aphaneura** GRIFFITH).

In Cuvier, The animal kingdom . . . with supplementary additions . . . by Edward Griffith and others, vol. 15, pl. 3, fig. 1, 1832.

Type.—*Alphaneura rufescens* WESTWOOD, 1832. (Monobasic.)

Alpigenobombus SKORIKOV.

Rev. Russe Ent., vol. 14, p. 128, 1914. Two species.

Type.—*Bombus lefebvrei* LEPELETIER, 1836 "(= *B. mastrucatus* auct.)." (Original designation.) *Bombus alpigenus* Morawitz, 1873, designated by Frison, Trans. Amer. Ent. Soc., vol. 53, p. 64, 1927, was not originally included.

Alpinobombus SKORIKOV.

Rev. Russe Ent., vol. 14, p. 122, 1914. Eight species.

Type.—(*Apis*) *Bremus alpinus* (LINNAEUS) 1758. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 66, 1927.)

(*Amalthea* RAFINESQUE) = *Trigona* JURINE.

Analyse de la nature . . . corps organisés, p. 123, 1815.

Type.—*Apis amalthea* OLIVIER, 1789. (Autobasic.)

Proposed unnecessarily for *Trigona* Jurine.

Amaurocosmia HOLMBERG, nomen nudum.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 226, 1887.

Amblyapis COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 362, 1910.

Type.—*Halictoides ilicifoliae* COCKERELL, 1910. (Monobasic and original designation.)

Proposed as a subgenus of *Halictoides* Nylander.

(*Amblys* KLUG) = *Osmia* PANZER.

Magazin für Insektenkunde, vol. 6, pp. 198 and 226, 1807. Two species.

Type.—([*Apis*] *Osmia bicornis* [LINNAEUS], 1758) = (*Apis*) *Osmia rufa* (LINNAEUS), 1758. (By designation of Latreille, Encycl. Méthod., Hist. Nat., Ins., vol. 8, p. 577, 1811.)

Isogenotypic with *Osmia* Panzer, *Ceratostomia* Thomson and through synonymy with *Pachyosmia* Ducke.

Amegachile FRIESE.

"Die Bienen Afrikas," Denkschr. med.-natur. Ges. Jena, vol. 14, p. 326, 1909. Nineteen species.

Type.—(*Megachile sjoestedti* FRIESE, 1901) = *Megachile bituberculata* RIRSEMA, 1880. (By designation of Cockerell, Rev. Zool. Bot. Africaines, vol. 20, p. 166, 1931.) *Megachile nasicornis* Friese, 1903, designated by Mitchell, Trans. Amer. Ent. Soc., vol. 59, p. 298, 1934.

Proposed as a subgenus of *Megachile* Latreille.

Amegilla FRIESE (= *Alfkenella* BÖRNER).

Die Bienen Europas, vol. 3, pp. 5 and 18, 1897. Many species.

Type.—(*Apis*) *Anthophora quadrifasciata* (VILLERS), 1789. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 10, vol. 7, p. 277, 1931.)

Proposed as a subgenus of *Podalirius* Latreille.

Isogenotypic with *Alfkenella* Börner.

Ammobates LATREILLE.

Genera crustaceorum et Insectorum . . . , vol. 4, p. 169, 1809. Two species.

Type.—*Ammobates rufiventris* LATREILLE, 1809. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.) (*Ammobates bicolor* Lepeletier and Serville) = *Ammobates bicolor* Lepeletier, 1825, designated by Blanchard, in Cuvier, Règne animal [ed. 3], insectes, text vol. 2, p. 213; atlas pl. 127, fig. 6 [1849]), was not originally included.

Ammobatoides RADOSZKOWSKI (= *Phiarus* GERSTAECKER; *Paidia* RADOSZKOWSKI, 1872, not Herrich-Schaefer, 1847).

Horae Soc. Ent. Ross., vol. 5, p. 82, 1868. Two species.

Type.—*Phileremus abdominalis* EVERSMANN, 1852. (Present designation.)

Isogenotype with *Phiarus* Gerstaecker and *Paidia* Radoszkowski.

(**Ammobatoides** SCHENCK, not RADOSZKOWSKI, 1868) = *Phileremus* LATREILLE.

Jahrb. Nassau. Ver. Naturk., vol. 21–22, p. 349, 1867–68 [1870].

Type.—(*Ammobates bicolor* LEPELETIER, 1825) = (*Epeolus*) *Phileremus kirbyanus* (LATREILLE, 1803). (Monobasic.)

Isogenotype with *Phileremus* Latreille through synonymy.

Ancyla LEPELETIER (= *Plistotrichia* MORAWITZ).

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 294, 1841.

Type.—*Ancyla oraniensis* LEPELETIER, 1841. (Monobasic.)

Isogenotype with *Plistotrichia* through synonymy.

Ancylandrena COCKERELL.

Pan-Pacific Ent., vol. 7, p. 5, 1930.

Type.—*Andrena* (*Ancylandrena*) *heterodoma* COCKERELL, 1930. (Monobasic.)

Proposed as a subgenus of *Andrena* Fabricius.

Ancyloscelis LATREILLE.

In Cuvier, Règne animal, ed. 2, vol. 5, p. 355, 1829. No species.

Haliday, Trans. Linn. Soc. London, vol. 17, p. 320, 1837. One species.

Type.—*Ancylosceles ursinus* HALIDAY, 1837. (First species included.) *Apis* (*Ancyloscelis*) *brasiliensis* BLANCHARD, 1849, designated by Blanchard, in Cuvier, Règne animal [ed. 3], insectes, text vol. 2, p. 217; atlas pl. 128, fig. 8 [1849].

Ancyloscelis BERTHOLD, nomen nudum.

Latreille's natürliche Familien des Thierreichs, p. 466, 1827.

Ancyloscelus BERTHOLD, nomen nudum.

Latreille's natürliche Familien des Tierreichs, p. 565, 1827.

(**Andineta** ASHMEAD) for *Audinetia* LEPELETIER.

Trans. Amer. Ent. Soc., vol. 26, p. 71, 1899.

Andrena FABRICIUS (= *Anthrena* ILLIGER).

Systema entomologiae . . . , p. 376, 1775. Fourteen species.

Type.—*Apis helvola* LINNAEUS, 1758. (By designation of Viereck, Proc. U. S. Nat. Mus., vol. 42, p. 613, 1912.) (*Andrena cineraria* Fabricius, 1804) = *Apis cineraria* Linnaeus, 1758, designated by Latreille, Considérations générales . . . des insectes, p. 439, 1810, was not originally included. (*Melitta nitida* Kirby, 1802) = *Apis nitida* Fourcroy, 1785, designated by Curtis, Brit. Ent., vol. 3, p. 129, 1826, was not originally included. (*Andrena funebris* Panzer, 1798) = *Apis albopunctata* Ross, 1792, designated by Blanchard, in Cuvier, Règne Animal [ed. 3], insectes, text vol. 2, p. 203; atlas, pl. 125, fig. 3 [1849], was not originally included.

Andrenella HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 210, 1933. Many species.

Type.—(*Melitta*) *Andrena minutula* (KIRBY), 1802. (Original designation.)

Andrenopsis COCKERELL.

Trans. Amer. Ent. Soc., vol. 31, p. 363, 1905.

Type.—*Andrenopsis flavorufus* COCKERELL, 1905. (Monobasic.)

Androgynella COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 313, 1911.

Type.—*Megachile detera* COCKERELL, 1910. (Monobasic and original designation.)

Andronicus CRESSON.

Proc. Ent. Soc., Philadelphia, vol. 2, p. 384, 1884.

Type.—*Andronicus cylindricus* CRESSON, 1884. (Monobasic.)

(Anhylaeus HEIDER) for **Anylaeus** BRIDWELL.

Preussische Akad. Wiss. Berlin: Nomenclator animalium generum et subgenerum, vol. 1, Lief. 2, p. 184, 1920.

(Anthedon ROBERTSON, not AGASSIZ, 1846) = **Abda**, new name.

Trans. Acad. Sci. St. Louis, vol. 10, p. 53, 1900.

Type.—*Melissodes compta* CRESSON, 1878. (Monobasic.)

(Anthemoessa ROBERTSON, not AGASSIZ, 1846) = **Melea**, new name.

Trans. Amer. Ent. Soc., vol. 31, p. 372, 1905.

Type.—*Anthophora abrupta* SAY, 1837. (Monobasic and original designation.)

(Anthemois ROBERTSON) = **Megachile** LATREILLE.

Trans. Amer. Ent. Soc., vol. 29, pp. 168, 169, and 172, 1903.

Type.—(*Megachile infragilis* CRESSON, 1878) = (*Apis*) *Megachile centuncularis* (LINNAEUS), 1758. (Monobasic and original designation.)

Isogenotypic with *Megachile* Latreille through synonymy.

Anthemurgus ROBERTSON.

Can. Ent., vol. 34, p. 321, 1902.

Type.—*Anthemurgus passiflorae* ROBERTSON, 1902. (Monobasic and original designation.)

Anthidiellum COCKERELL (= **Cerianthidium** FRIESE).

Bull. Southern California Acad. Sci., vol. 3, p. 3, 1904.

Type.—(*Trachusa*) *Anthidium strigatum* (PANZER), 1804. (Monobasic and original designation.)

Isogenotypic with *Cerianthidium* Friese.

Anthidium FABRICIUS.

Systema Piezatorum, p. 364, 1804. Eleven species.

Type.—*Apis manicata* LINNAEUS, 1758. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.)

(Anthochaessa GISTEL) = **Andrena** FABRICIUS.

Isis (Encycl. Zeitschr.), No. 6, p. 82, 1850.

Type.—*Apis helvola* LINNAEUS, 1758. (Autobasic.)

Proposed unnecessarily for *Andrena* Fabricius which Gistel considered to be preoccupied by *Anthrenus* Geoffroy, 1764.

Anthocopa LEPELETIER AND SERVILLE (= **Furcosmia** SCHMIEDEKNECHT and **Phyllotoma** DUMÉRIL, 1860, not LEACH, 1819, not FALLÉN, 1829).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 314, 1825.

Type.—(*Anthocopa papaveris* LEPELETIER and SERVILLE, 1825) = *Apis papaveris* LATREILLE, 1799. (Monobasic.)

Isogenotypic with *Furcosmia* Schmiedeknecht and *Phyllotoma* Duméril.

Anthodiocetes HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, pp. 86 and 226, 1887. Nomen nudum.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 435, 1903. Two species.

Type.—*Anthodiocetes megachiloides* HOLMBERG, 1903. (By designation of Cockerell, Proc. U. S. Nat. Mus., vol. 71, art. 12, p. 2, 1927.)

Anthoglossa F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 16, 1853.

Type.—*Anthoglossa plumata* F. SMITH, 1853. (Monobasic.)

(*Anthophora* LATREILLE) = *Podalirius* LATREILLE.

Nouv. Dict. Hist. Nat., vol. 18, p. 167, 1803.

Type.—(*Apis pilipes* FABRICIUS, 1775) = *Apis acervorum* LINNAEUS, 1758.

(By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 422, 1915.) Latreille, *Considérations générales . . . des Insectes*, p. 439, 1810, cites more than one species. *Apis retusa* Linnaeus, 1758, designated by Curtis, Brit. Ent., vol. 8, expl. pl. 357, 1831, was not originally included in *Podalirius*.

Anthophora was proposed by Latreille to replace *Podalirius* Latreille which he considered to be preoccupied by *Podalirius* Lamarck, 1801, used for a genus of plants. The placement of *Anthophora* Latreille on the Official List of Generic Names is under consideration by the International Commission, Science, vol. 83, p. 552, 1936.

Anthophorites HEER [fossil].

Neue Deukschr. allgemein. schweizerischen Ges. gesamt. Naturw., vol. 11, p. 97, 1850. Four species.

Type.—*Anthophorites mellona* HEER, 1850. (Present designation.)

Anthophoroides COCKERELL AND COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 48, 1901.

Type.—*Podalirius vallorum* COCKERELL, 1896. (Monobasic and original designation.)

Anthophorula COCKERELL.

Bull. New Mexico Agr. Exp. Stat., No. 24, p. 44, 1897.

Type.—*Anthophorula compactula* COCKERELL, 1897. (Monobasic.)

(*Anthrena* ILLIGER) for *Andrena* FABRICIUS.

Magazin für Insektenkunde, vol. 1, p. 127, 1801.

Anthrenoides DUCKE.

Zeitschr. Syst. Hym. Dipt., vol. 7, p. 368, 1907.

Type.—*Anthrenoides alfkeni* DUCKE, 1907. (Monobasic.)

Anylaeus BRIDWELL (= *Anhylaeus* HEIDER).

Proc. Hawaiian Ent. Soc., vol. 4, p. 129, 1919. Two species.

Type.—*Nothylaeus (Anylaeus) aberrans* BRIDWELL, 1919. (Original designation.)

Proposed as a subgenus of *Nothylaeus* Bridwell.

(*Apathus* NEWMAN) = *Psithyrus* LEPELETIER.

Ent. Mag., vol. 2, p. 404 footnote, 1835.

Type.—*Apis rupestris* FABRICIUS, 1793. (Autobasic.)

Proposed for *Psithyrus* Lepeletier which Newman considered to be preoccupied by *Psithyros* Hübner.

Aphalictus COCKERELL.

Mem. Queensland Mus., vol. 10, p. 40, 1930.

Type.—*Parasphecodes bribiensis* COCKERELL, 1916. (Monobasic and original designation.)

(*Aphaneura* GRIFFITH) for *Alphaneura* WESTWOOD.

In Cuvier, The animal kingdom . . . with supplementary additions . . . by Edward Griffith and others, vol. 15, p. 575, 1832.

Apiaria GERMAR [fossil].

Nov. Act. Acad. Nat. Curios., vol. 19, p. 210, 1839.

Type.—*Apiaria antiqua* GERMAR, 1839. (Monobasic.)

(*Apiarus* RAFINESQUE) = *Apis* LINNAEUS.

Analyse de la nature . . . corps organisés, p. 123, 1815.

Type.—(*Apis mellifica* FABRICIUS, 1775) = *Apis mellifera* LINNAEUS, 1758. (Autobasic.)

Proposed unnecessarily for *Apis* Linnaeus.

***Apis* LINNAEUS (= *Apiarus* RAFINESQUE).**

Systema naturae, ed. 10, pp. 343 and 574, 1758. Thirty-eight species.

Type.—(*Apis mellifica* FABRICIUS, 1775) = *Apis mellifera* LINNAEUS, 1758. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.)

(*Apista* F. SMITH, not HÜBNER, 1816) = *Egapista* COCKERELL.

Journ. Ent., vol. 1, p. 148, 1861.

Type.—*Apista opalina* F. SMITH, 1861. (Monobasic.)

***Archianthidium* MAVROMOUSTAKIS.**

Ann. Mag. Nat. Hist., ser. 11, vol. 3, p. 91, 1939. Four species.

Type.—*Anthidium laticeps* MORAWITZ, 1873. (Original designation.)

***Archimegachile* ALFKEN.**

Konowia, vol. 12, p. 56, 1933. Six species.

Type.—*Megachile flavipes* SPINOLA, 1838. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

***Arctosmia* SCHMIEDEKNECHT (= *Lithosmia* ALFKEN).**

Apidae Europaeae, vol. 2, p. 21 [1887], 1884–86 [1885].

Type.—(*Megachile villosa* SCHENCK, 1853, not *Apis villosa* FABRICIUS, 1775) = *Osmia platycera* GERSTAECKER, 1869. (Monobasic.)

Proposed as a subgenus of *Osmia* Panzer.

Isogenotypic with *Lithosmia* Alfken.

***Argochila* MICHENER.**

Amer. Midland Nat., vol. 22, pp. 9 and 58, 1939. Fourteen species.

Type.—*Ashmeadiella timberlakei* MICHENER, 1936. (Original designation.)

Proposed as a subgenus of *Ashmeadiella* Cockerell.

***Argyropile* MITCHELL.**

Trans. Amer. Ent. Soc., vol. 59, pp. 302, 308, and 311, 1934. Four species.

Type.—*Megachile parallela* F. SMITH, 1853. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

***Argyroselenis* ROBERTSON.**

Can. Ent., vol. 35, p. 284, 1903.

Type.—*Triepeolus minimus* ROBERTSON, 1902. (Monobasic and original designation.)

Synonym of *Epeolus* Latreille, according to Linsley, Pan-Pacific Ent., vol. 15, p. 1, 1939.

***Arhysosage* BRÈTHES.**

Anal. Soc. Cient. Argentina, vol. 93, p. 121, 1922.

Type.—*Arhysosage johnsoni* BRÈTHES, 1922. (Monobasic.)

***Asaropoda* COCKERELL.**

Ann. Mag. Nat. Hist., ser. 9, vol. 18, p. 216, 1926. Two species.

Type.—*Saropoda bombiformis* F. SMITH, 1854. (Original designation.)

***Ashmeadiella* COCKERELL.**

Ent. News, vol. 8, p. 197, 1897. Five species.

Type.—*Heriades opuntiae* COCKERELL, 1897. (Original designation.)

***Ashtonipsithyrus* FRISON.**

Trans. Amer. Ent. Soc., vol. 53, p. 69, 1927. Two species.

Type.—(*Apathus*) *Psithyrus ashtoni* (CRESSON), 1864. (Original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Aspidosmia BRAUNS.

Zool. Jahrb., Abt. Syst., Jena, vol. 52, p. 208, 1926.

Type.—*Osmia* (*Aspidosmia*) *arnoldi* BRAUNS, 1926. (Monobasic.)

Proposed as a subgenus of *Osmia* Panzer.

Atoposmia COCKERELL.

Pan-Pacific Ent., vol. 11, p. 50, 1935.

Type.—*Osmia* (*Atoposmia*) *tridonta* COCKERELL, 1935. (Monobasic.)

Proposed as subgenus of *Osmia* Panzer.

(Audineta ASHMEAD) for Audinetia LEPELETIER.

Trans. Amer. Ent. Soc., vol. 23, p. 97, 1890.

(Audineta LEPELETIER) = Platynopoda WESTWOOD.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 203, 1841. Six species.

Type.—(*Xylocopa latipes* FABRICIUS, 1804) = *Apis latipes* DRURY, 1773. (Present designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

Isogenotypic with *Platynopoda* Westwood.

Augochlora F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 73, 1853. Many species.

Type.—*Halictus purus* SAY, 1937. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 448, 1923.)

Augochlorella SANDHOUSE.

Journ. Washington Acad. Sci., vol. 27, p. 63, 1937. Four species.

Type.—*Augochlora gratiosa* F. SMITH, 1853. (Original designation.)

Augochloropsis COCKERELL.

Can. Ent., vol. 29, p. 4, 1897. Four species.

Type.—(*Augochlora* (*Augochloropsis*) *subignita* COCKERELL, 1897) = *Augochlora ignita* F. SMITH, 1861. (Original designation.) *Augochlora spinolae* Cockerell, 1900, designated by Schrottky, Deutsche Ent. Zeitschr., p. 481, 1909, was not originally included.

Proposed as a subgenus of *Augochlora* F. Smith.

(Augochloropsis SCHROTTKY, 1909, not COCKERELL, 1897) = Paraugochlora SCHROTTKY.

Deutsche Ent. Zeitschr., p. 481, 1909. Two species.

Type.—*Augochlora spinolae* COCKERELL, 1900. (Designated by Schrottky, Deutsche Ent. Zeitschr., p. 481, 1909.)

Auricularia MÉHELY.

Naturgeschichte der Urbienen, pp. 41 and 147, 1935. Three species.

Invalid under Article 25c of the International Rules of Zoological Nomenclature, since no type was designated.

(Auricularia POPOV, not BLAINVILLE, 1816, not DeFRANCE, 1816, not FABRICIUS, 1823, not MÜLLER, 1850) = Prosopis FABRICIUS, 1804.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Type.—(*Mellinus*) *Prosopis bipunctatus* FABRICIUS, 1798. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Isogenotypic with *Prosopis* Fabricius, 1804, through synonymy.

Auricularia was first proposed by Méhely, Naturgeschichte der Urbienen, pp. 41 and 147, 1935, as a subgenus of *Prosopis* Fabricius to include three species, but no original genotype designation was made and, according to Article 25c (amendment), *Auricularia* Méhely, 1935, is invalid.

Austrandrena COCKERELL.

Psyche, vol. 13, p. 37, 1906.

Type.—*Andrena modesta* F. SMITH, 1879. (Monobasic and original designation.)

Proposed as a subgenus of *Protandrena* Cockerell.

Austrodioxys COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 17, p. 432, 1916.

Type.—*Austrodioxys thomasi* COCKERELL, 1916. (Monobasic.)

Autochelostoma SLADEN.

Can. Ent., vol. 48, p. 270, 1916.

Type.—*Autochelostoma canadensis* SLADEN, 1916. (Monobasic.)

Baana, new name (=Ctenopoda MA, 1938, not McATEE AND MALLOCH, 1933).

Type.—*Apis fenestrata* FABRICIUS, 1798. (Autobasic.)

(Barbata MÉHELY, not HUMPHREY, 1797, not SWAINSON, 1840) = Mehelya POPOV.

Naturgeschichte der Urbienen, pp. 32 and 135, 1935.

Type.—*Prosopis friesei* ALFKEN, 1904. (Monobasic.)

Proposed as a subgenus of *Prosopis* FABRICIUS.

Berna FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 30, p. 668, 1911.

Type.—(*Megachile* (Berna) *africana* FRIESE, 1911, not *Megachile africana* MOCSARY, 1887) = *Megachile africanida* STRAND, 1914. (Monobasic.)

Proposed as a subgenus of *Megachile* Latreille.

Betheliella COCKERELL.

Ent. News, vol. 35, p. 169, 1924.

Type.—*Betheliella calocharti* COCKERELL, 1924. (Monobasic.)

Biareolina DOURS.

Rev. et Mag. Zool., ser. 3, vol. 1, p. 288, 1873. Two species.

Type.—*Biareolina neglecta* DOURS, 1873. (Present designation.)

Blastes PANZER (=Rhineta KLUG).

Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 239, 1806.

Type.—*Tiphia brevicornis* PANZER, 1798. (Monobasic.)

Isogenotypic with *Rhineta* Klug through synonymy.

Blastoides SCHENCK.

Berlin. Ent. Zeitschr., vol. 17, p. 252, 1873.

Type.—(*Pasites punctatus* SCHENCK, 1870) = *Phileremus emarginatus* SCHENCK, 1853. (Monobasic.)

Synonym of *Blastes* Panzer, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 501, 1896.

Bicolletes FRIESE.

Flora og Fauna Aarbog, vol. 10, p. 11, 1908. Three species.

Type.—*Bicolletes neotropica* FRIESE, 1908. By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 8, vol. 15, p. 342, 1915.

Bicornelia FRIESE.

Ann. naturhist. Hofmus. Wien, vol. 14, p. 239, 1899.

Type.—*Bicornelia serrata* FRIESE, 1899. (Monobasic.)

Biglossa FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 374, 1906. Eight species.

Type.—*Biglossa thoracica* FRIESE, 1906. (By designation of Cockerell, Journ. New York Ent. Soc., vol. 22, p. 323, 1914.)

Biluna MA.

Rec. Indian Mus., vol. 40, pp. 270 and 276, 1938. Two species.

Type.—*Xylocopa nasalis* WESTWOOD, 1838. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

Binghamiella COCKERELL.

Bull. Amer. Mus. Nat. Hist., vol. 23, p. 235, 1907.

Type.—*Sphecodes antipodes* F. SMITH, 1853. (Monobasic.)

Birkmania VIERECK.

Proc. Ent. Soc. Washington, vol. 11, p. 50, 1909.

Type.—(*Birkmania andrenoides* VIERECK, 1909) = *Panurginus polytrichus* COCKERELL, 1909. (Monobasic and original designation.)

Synonym of *Panurginus* NYLANDER, according to Crawford, Proc. Ent. Soc. Washington, vol. 28, p. 213, 1926.

Bombias ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, p. 176, 1903. Three species.

Type.—*Bombias auricomus* ROBERTSON, 1903. (Original designation.)

Bomboxylocopa MA.

Lingnan Sci. Journ., vol. 18, p. 155, 1939. Three species.

Type.—*Xylocopa bombooides* F. SMITH, 1879. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

Bombomelecta PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 370, 1879.

Type.—*Melecta thoracica* CRESSON, 1876. (Monobasic.)

Synonym of *Melecta* Latreille, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 313, 1896, and Linsley, Ann. Ent. Soc. America, vol. 32, p. 435, 1939.

Bombus LATREILLE (=Bremus JURINE, 1801; Bremus PANZER, 1804(?)).

Histoire naturelle de Fourmis, p. 437, 1802.

Type.—(*Apis terrestris* FABRICIUS, 1775) = *Apis terrestris* LINNAEUS, 1758. (Monobasic.)

Isogenotypic with *Terrestribombus* Vogt and *Leucobombus* Dalla Torre.

The suppression of the "Erlangen List" by the International Commission (Opinion 135, 1939) invalidates *Bremus* Jurine, 1801.

Bombusoides MOTSCHULSKY [fossil].

Etud. Ent., vol. 5, p. 28, 1856.

Type.—*Bombusoides mengi* MOTSCHULSKY, 1856. (Monobasic.)

Brachycephalapis VIERECK.

Proc. Ent. Soc. Washington, vol. 11, p. 47, 1909.

Type.—*Melitta (Brachycephalapis) californica* VIERECK, 1909. (Monobasic and original designation.)

Proposed as a subgenus of *Melitta* Kirby.

(Brachyglossa FRIESE, not BOISDUVAL, 1829, not FAUVEL, 1866) = Brachyglossula HEDICKE.

Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 577, 1922.

Type.—*Brachyglossa rufocaerulea* FRIESE, 1922. (Monobasic.)

Brachyglossula HEDICKE (=Pasiphae SPINOLA, 1851, not LATREILLE, 1819;

Brachyglossa FRIESE, 1922, not BOISDUVAL, 1829, not FAUVEL, 1866).

Deutsche Ent. Zeitschr., p. 427, 1922.

Type.—*Brachyglossa rufocaerulea* FRIESE, 1922. (Autobasic with *Brachyglossa* Friese).

Brachymelecta LINSLEY.

Ann. Ent. Soc. America, vol. 32, p. 458, 1919.

Type.—*Melecta mucida* CRESSON, 1879. (Monobasic and original designation.)

Brachynomada HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 22, pp. 239 and 272, 1886. Two species.

Type.—*Brachynomada argentina* HOLMBERG, 1886. (Present designation.)

(Bremus JURINE) = Bombus LATREILLE.

Erlangen Litteratur-Zeitung, vol. 1, p. 164, 1801.

Type.—*Apis terrestris* LINNAEUS, 1758. (By designation of Morice and Durant, Trans. Ent. Soc. London, p. 428, 1915).

Isogenotypic with *Bombus* Latreille, *Terrestribombus* Vogt, and *Leucobombus* Dalla Torre.

The suppression of the "Erlangen List" (Opinion 135) by the International Commission invalidates *Bremus* Jurine, 1801.

(Bremus PANZER, not JURINE 1801) = Bombus LATREILLE.

Faunae Insectorum Germaniae initia, Heft 85, 1804 (?). Three species.

Type.—*Apis agrorum* FABRICIUS, 1787. (By present designation.) *Apis terrestris* Linnaeus, 1758 (= *Bremus fasciatus* Panzer, 1801) designated by Richards, The generic names of British insects, pt. 5, p. 92, 1937, was not originally included.

The year of publication of the name *Bremus* Panzer is not certain. Sherborn, Ann. Mag. Nat. Hist., ser. 9, vol. 11, p. 567, 1923, has indicated that Heft 85 of the Panzer work may have appeared as early as 1801, although Heft 86 was not published until 1804. In view of this situation and taking into consideration the proposal by Richards (*l. c.*) that "*Bombus* Latreille, 1802 (type *Apis terrestris* Linnaeus, 1758) be added to the Official List of Generic Names," and "*Bremus* Panzer, 1801 . . . be set aside and have no status in nomenclature," it has seemed advisable to assume that *Bombus* Latreille antedates *Bremus* Panzer.

(Cacosoma F. SMITH, not FELDER, 1874) = Neocorynura SCHROTTKY.

Descriptions of new species of Hymenoptera in the collection of the British Museum, p. 39, 1879. Five species.

Type.—*Cacosoma discolor* F. SMITH, 1879. (Present designation.)

Cadeguala REED.

Actes Soc. Sci. Chile, vol. 2, p. 234, 1892. Three species.

Type.—(*Colletes chilensis* SPINOLA, 1851) = (*Colletes*) *Diphaglossa occidentalis* (HALIDAY), 1836. (By present designation.)

Synonym of *Diphaglossa* Spinola, according to Herbst, Stettin. Ent. Zeit., vol. 82, p. 109, 1921.

Caenohalictus CAMERON.

Trans. Amer. Ent. Soc., vol. 29, p. 231, 1903.

Type.—*Caenohalictus trichiothalmus* CAMERON, 1903. (Monobasic.)

Caenomada ASHMEAD (= Chacoana HOLMBERG).

Trans. Amer. Ent. Soc., vol. 26, p. 68, 1899.

Type.—*Caenomada bruneri* ASHMEAD, 1899. (Monobasic and original designation.)

Isogenotypic with *Chacoana* Holmberg through synonymy.

Synonym of *Epicharis* Klug, according to Friese, Deutsche Ent. Zeitschr., 1909, Beiheft, p. 128, 1909.

Caenoprosopis HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 23, p. 22, 1887.

Type.—*Caenoprosopis crabronina* HOLMBERG, 1887. (Monobasic.)

Caesarea FRIESE.

Arch. Naturg., Jahrg. 77, Bd. 1, Heft 2, p. 142, 1911. Two species.

Type.—*Ammobates (Caesarea) deprcssa* FRIESE, 1911. (Present designation.)

Proposed as a subgenus of *Ammobates* Latreille.

(*Caliendra* GISTEL) = *Exaerete* HOFFMANNSEGG.

Naturgeschichte des Thierreichs, p. viii, 1848.

Type.—(*Chrysantheda nitida* PERTY, 1833) = (*Apis*) *Exaerete dentata* (LINNAEUS), 1758.

Proposed unnecessarily for *Chrysantheda* Perty.

Isogenotypic with *Chrysantheda* Perty, and through synonymy with *Exaerete* Hoffmannsegg.

Callandrena COCKERELL.

Trans. Amer. Ent. Soc., vol. 25, p. 186, 1898.

Type.—*Panurgus manifestus* FOX, 1894. (Monobasic.)

Callanthidium COCKERELL.

Proc. California Acad. Sci., ser. 4, vol. 14, p. 365, 1925. Three species.

Type.—*Anthidium illustre* CRESSON, 1879. (Original designation.)

Callopeetersia COCKERELL.

Rev. Zool. Bot. Africaines, vol. 30, p. 329, 1938. Three species.

Type.—*Halictus lasurcus* FRIESE, 1910. (Original designation.)

Proposed as a subgenus of *Eupettersia* Blüthgen.

Calliopsis F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 128, 1853.

Four species.

Type.—*Calliopsis andreniformis* F. SMITH, 1853. (By designation of Ashmead, Trans. Amer. Ent. Soc., vol. 26, p. 83, 1899.)

(*Callobombus* DALLA TORRE) for *Kallobombus* DALLA TORRE.

Catalogus hymenopterorum, vol. 10, p. 503, 1896.

Calloceratina COCKERELL.

Proc. Ent. Soc. Washington, vol. 26, p. 77, 1924.

Type.—*Ceratina amabilis* COCKERELL, 1897. (Monobasic and original designation.)

Callomelecta COCKERELL.

Ann. Mag. Nat. Hist., ser. 9, vol. 18, p. 621, 1926.

Type.—*Callomelecta pendleburyi* COCKERELL, 1926. (Monobasic and original designation.)

Callomelitta F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 85, 1853.

Type.—*Callomelitta picta* F. SMITH, 1853. (Monobasic.)

Callonychium BRÈTHES.

Anal. Soc. Cient. Argentina, vol. 93, p. 120, 1922.

Type.—*Callonychium argentinum* BRÈTHES, 1922. (Monobasic.)

Callosphcodes FRIESE.

Ann. Hist. Nat. Mus. Hungarici, vol. 7, p. 182, 1909.

Type.—*Sphcodes* (*Callosphcodes*) *raluncensis* FRIESE, 1909. (Monobasic.)

Proposed as a subgenus of *Sphcodes* Latreille.

(*Calospiloma* BRÈTHES) = *Palinepeolus* HOLMBERG.

Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 68, footnote, 1909.

Two species.

Type.—*Epeolus viperinus* HOLMBERG, 1886. (Original designation.)

Isogenotypic with *Palinepeolus* Holmberg.

Calyptapis COCKERELL [fossil].

Bull. Mus. Comp. Zool., vol. 50, p. 41, 1906.

Type.—*Calyptapis florissantensis* COCKERELL, 1906. (Monobasic.)

(*Campanularia* MÉHELY, not LAMARCK, 1816) = *Paraprosopis* POPOV.

Naturgeschichte der Urblenen, pp. 50 and 157, 1935. Seven species.

Proposed as a subgenus of *Prosopis* FABRICIUS, but invalid under Article 25c (amendment) of the International Rules of Zoological Nomenclature, since no genotype was designated.

Camptopoeum SPINOLA.

Ann. Soc. Ent. France, ser. 2, vol. 1, p. 139, 1843. Two species.

Type.—*Prosopis frontalis* FABRICIUS, 1804. (Original designation.)

Campylogaster DOUBS.

Rev. et Mag. Zool., ser. 3, vol. 1, p. 288, 1873. Three species.

Type.—(*Andrena* (*Campylogaster*) *fulvo-crustatus* DOUBS, 1873) = *Andrena erberi* MORAWITZ, 1872. (Present designation.)

Proposed as a subgenus of *Andrena* FABRICIUS.

(*Canephora* FRIESE, not HÜBNER, 1822, not KOENIG, 1825) = *Canephorula* JÖRGENSEN.

Flora og Fauna Aarbog, vol. 10, p. 94, 1908.

Type.—*Corbicula apiformis* FRIESE, 1908. (Autobasic.)

Proposed for *Corbicula* Friese, 1908, not Megerle, 1811.

Canephorula JÖRGENSEN (= *Canephora* FRIESE, 1908, not HÜBNER, 1822, not KOENIG, 1825; *Corbicula* FRIESE, 1908, not MEGERLE, 1811).

Deutsche Ent. Zeitschr., p. 212, 1909.

Type.—*Corbicula apiformis* FRIESE, 1908. (Autobasic.)

Capicola FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 30, p. 672, 1911.

Type.—*Capicola braunsiana* FRIESE, 1911. (Monobasic.)

Synonym of *Hesperapis* Cockerell, according to Cockerell and Ireland, Proc. Nat. Acad. Sci., vol. 19, p. 972, 1933.

Caupolicana SPINOLA (= *Caupolicania* SCHULZ).

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 212, 1851. Four species.

Type.—*Caupolicana gayi* SPINOLA, 1851. (Present designation.)

(*Caupolicania* SCHULZ) for *Caupolicana* SPINOLA.

Spolia Hymenopterologica, p. 238, 1906.

(*Cellaria* FRIESE, not ELLIS AND SOLANDER, 1786, not HAWORTH, 1828) = *Cellariella* SIBAND.

Deutsche Ent. Zeitschr., p. 575, 1913.

Type.—(*Nomioides* (*Cellaria*) *arnoldi* FRIESE, 1913) = *Nomioides* (*Cellariella*) *somalica* MAGRETTI, 1899. (Monobasic.)

Proposed as a subgenus of *Nomioides* Schenck.

Cellariella SIBAND (= *Cellaria* FRIESE, 1913, not ELLIS AND SOLANDER, 1786, not HAWORTH, 1828).

Arch. Naturg., Jahrg. 92, Abt. A, Heft 8, p. 53, 1926.

Type.—(*Nomioides* (*Cellaria*) *arnoldi* FRIESE, 1913) = *Nomioides* (*Cellariella*) *somalica* MAGRETTI, 1899. (Autobasic.)

Cemolobus ROBERTSON.

Can. Ent., vol. 34, p. 324, 1902.

Type.—*Xenoglossa ipomueae* ROBERTSON, 1891. (Monobasic and original designation.)

Centrias ROBERTSON.

Can. Ent., vol. 35, p. 174, 1903. Two species.

Type.—*Nomada erigeronis* ROBERTSON, 1897. (Original designation.)

Centris FABRICIUS (= *Eulaema* LEPELETIER).

Systema Piezatorum, p. 354, 1804. Many species.

Type.—*Apis dimidiata* FABRICIUS, 1793. (By designation of Blanchard, *Histoire naturelle des insectes* . . . , vol. 3, p. 405, 1840.) ([*Apis*] *Centris hirtipes* Fabricius, 1793) = *Apis rustica* Olivier, 1789, designated by Blanchard, in Cuvier, *Règne animal* [ed. 3], insectes, text vol. 2, p. 217; atlas pl. 128 bis, fig. 7 [1849].

Isogenotypic with *Eulaema* Lepeletier.

(*Centris* auct., not FABRICIUS) = *Hemisia* KLUG.

Centrodes KLUG, nomen nudum.

Magazin für Insektenkunde, vol. 6, p. 217, 1807.

Centrosmia ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 165, 166, and 170, 1903.

Type.—*Osmia bucephala* CRESSON, 1864. (Monobasic and original designation.)

Synonym of *Melanosmia* SCHMIEDEKNECHT, according to Sandhouse, *Mem. Ent. Soc. Washington*, No. 1, p. 33, 1939.

Cephalapis COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 23, 1910.

Type.—*Chelostoma* (*Cephalapis*) *jacintanum* COCKERELL, 1910. (Monobasic and original designation.)

Proposed as a subgenus of *Chelostoma* Latreille.

Cephalictoides COCKERELL.

Psyche, vol. 31, p. 244, 1924.

Type.—*Halictoides paradoxus* MORAWITZ, 1867. (Monobasic and original designation.)

Proposed as a subgenus of *Halictoides* Nylander.

Cephalosmia SLADEN.

Can. Ent., vol. 48, p. 270, 1916.

Type.—(*Osmia armaticeps* CRESSON, 1878) = *Osmia montana* CRESSON, 1864. (Monobasic.)

Cephen ROBERTSON.

Can. Ent., vol. 35, pp. 174 and 176, 1903.

Type.—*Nomada texana* CRESSON, 1872. (Monobasic and original designation.)

(*Ceraplastes* GISTEL) = *Stelis* PANZER.

Naturgeschichte des Thierreichs, p. x, 1848.

Type.—(*Apis aterrima* PANZER, 1798, not CHRIST, 1791) = *Apis punctulatissima* KIRBY, 1802. (Autobasic with *Stelis*.)

Proposed unnecessarily for *Stelis* Latreille, which Gistel considered to be preoccupied by a genus of plants.

Isogenotypic with *Stelis* Panzer, *Gyrodroma* Klug, and *Gymnus* Spinola. *Trachusa* Jurine, 1801, also isogenotypic with *Stelis*, has been invalidated by Opinion 135 of the International Commission on Zoological Nomenclature.

(*Ceratlas* ROBERTSON, not KROYER, 1845) = *Sayapis* TITUS.

Trans. Amer. Ent. Soc., vol. 29, pp. 168 and 172, 1903. Three species.

Type.—*Megachile pugnatus* SAY, 1837. (Original designation.)

Isogenotypic with *Gnathocera* Provancher and *Sayapis* Titus through synonymy.

(Ceratina LATREILLE)=Clavicera LATREILLE.

Histoire naturelle . . . des crustacés et des insectes, vol. 3, p. 380, 1802.

Type.—(*Hylaeus albilabris* FABRICIUS, 1793)=*Apis cucurbitina* ROSSI, 1792. (Autobasic.)

Proposed for *Clavicera* Latreille, which he considered to be incorrectly formed. Richards, The generic names of British insects, pt. 5, p. 91, 1937, has proposed that *Ceratina* Latreille (type *Hylaeus albilabris* Fabricius, 1793=*Apis cucurbitina* Rossi, 1792) be added to the Official List of Generic Names.

Ceratinidia COCKERELL AND PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 406, 1899.

Type.—*Ceratina hieroglyphica* F. SMITH, 1854. (Monobasic and original designation.)

Proposed as a subgenus of *Ceratina* Latreille.

(Ceratostmia THOMSON)=Osmia PANZER.

Hymenoptera Scandinaviae, vol. 2, pp. 232 and 235, 1872. No species.

Schmiedeknecht, Apidae Europaeae, vol. 2, p. 19 [885], 1884-6 [1885]. Four species.

Type.—(*Apis bicornis* LINNAEUS, 1758)=*Apis rufa* LINNAEUS, 1758. (By designation of Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 9, 1939.)

Proposed as a subgenus of *Osmia* Panzer.

Isogenotypic with *Osmia* Panzer, *Amblys* Klug, and through synonymy with *Pachyosmia* Ducke.

(Ceranthidium FRIESE)=Anthidiellum COCKERELL.

Die europäischen Bienen (Apidae), Lief. 3, p. 304, 1923. Two species.

Type.—(*Trachusa*) *Anthidium strigatum* (PANZER), 1804. (By designation of Cockerell, Proc. California Acad. Sci., ser. 4, vol. 14, p. 361, 1925.)

Isogenotypic with *Anthidiellum* Cockerell.

Ceylalictus STRAND.

Arch. Naturg., vol. 79, Abt. A, Heft 2, p. 137, 1913.

Type.—*Halictus horni* STRAND, 1913. (Monobasic.)

(Ceylonicola FRIESE)=Sudila CAMERON.

Zool. Jahrb., Abt. Syst., Jena, vol. 41, p. 501, 1918. Three species.

Type.—(*Ceylonicola atra* FRIESE, 1918)=*Sudila bidentata* Cameron, 1898. (Present designation.)

Isogenotypic with *Sudila* Cameron through synonymy.

(Chacoana HOLMBERG)=Caenonomada ASHMEAD.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887. Nomen nudum.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 432, 1903.

Type.—(*Chacoana melanoxantha* HOLMBERG, 1903)=*Caenonomada brunci* Ashmead, 1899. (Monobasic.)

Isogenotypic with *Caenonomada* Ashmead through synonymy, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 223, 1909.

Synonym of *Epicharis* Klug, according to Friese, Deutsche Ent. Zeitschr., 1909, Beiheft, p. 128, 1909.

Chalcobombus COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, pp. 7 and 11, 1909. Two species.

Type.—*Chalcobombus humilis* COCKERELL, 1909. (Original designation.)

Chalcosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, p. 20 [886], 1884-6 [1885]. Twenty-one species.

Type.—*Apis fulviventris* PANZER, 1798. (By designation of Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 13, 1939.)

Proposed as a subgenus of *Osmia* Panzer.

Chalepogenus HOLMBERG (=Desmotetrapedia SCHROTTKY).

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 416, 1903.

Type.—(*Chalepogcnus incertus* HOLMBERG, 1903)=*Tetrapedia muelleri* FRIESE, 1899. (Monobasic.)

Isogenotypic with *Desmotetrapedia* Schrottky through synonymy, according to Cockerell, Journ. New York Ent. Soc., vol. 22, p. 320, 1914.

Chalicodoma LEPELETIER.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 309, 1841. Four species.

Type.—(*Xylocopa muraria* FABRICIUS, 1804)=*Apis muraria* RETZIUS, 1783. (By designation of Girard, Traité élémentaire d'entomologie, vol. 2, p. 778, 1879.)

Mitchell, Trans. Amer. Ent. Soc., vol. 59, p. 297, 1934, accepting Latreille's (Considérations générales . . . des insectes, p. 439, 1810) citation of four species ("*Xylocopa muraria* Fab.—EjUSD. *Anthophorae: lanata, argentata, centuncularis.*") as a designation of the first-named for *Megachile*, considers *Chalicodoma* to be isogenotypic with *Megachile* Latreille.

Charitandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 210, 1933. Three species.

Type.—(*Nomada*) *Andrena hattorfiana* (FABRICIUS), 1775. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Chelostoma LATREILLE.

Genera crustaceorum et insectorum . . . , vol. 4, p. 161, 1809.

Type.—(*Apis maxillosa* LINNAEUS, 1767)=*Apis florissomnis* LINNAEUS, 1758. (Monobasic.)

Chelostomoides ROBERTSON.

Can. Ent., vol. 33, p. 231, 1901.

Type.—(*Megachile rufimanus* ROBERTSON, 1891)=*Chelostoma rugifrons* F. SMITH, 1854. (Monobasic and original designation.)

Chelostomopsis COCKERELL (=Raphidostoma COCKERELL).

Proc. California Acad. Sci., ser. 4, vol. 14, p. 204, 1925. Two species.

Type.—*Chelynia rubifloris* COCKERELL 1898. (Original designation.)

Isogenotypic with *Raphidostoma* Cockerell through synonymy.

Chelynia PROVANCHER.

Additions et corrections à la faune hyménoptérologique de la Province de Québec, pp. 296 and 322, 1888.

Type.—*Chelynia labiata* PROVANCHER, 1888. (Monobasic.)

Chilicola SPINOLA.

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 210, 1851. Three species.

Type.—*Chilicola rubriventris* SPINOLA, 1851. (Present designation.)

Chilosima MICHENER.

Amer. Midland Nat., vol. 22, pp. 8 and 78, 1939. Three species.

Type.—*Ashmeadiella rhodognatha* COCKERELL, 1925. (Original designation.)

Proposed as a subgenus of *Ashmeadiella* Cockerell.

Chlerogas VACHAL.

Misc. Ent., vol. 12, p. 127, 1904.

Type.—*Halictus chlerogas* VACHAL, 1904. (Monobasic and by absolute tautonymy.)

Chloralictus ROBERTSON.

Can. Ent., vol. 34, pp. 245 and 248, 1902. Sixteen species.

Type.—*Halictus cressoni* ROBERTSON, 1890. (Original designation.)

Chlorandrena PÉRELZ.

Actes Soc. Linn. Bordeaux, vol. 44, p. 172, 1890. Fourteen species.

Type.—*Andrena humilis* IMHOFF, 1832. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 211, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

Chloroceratina COCKERELL.

Philippine Journ. Sci., vol. 13, p. 143, 1918. Two species.

Type.—*Ceratina (Chloroceratina) cyanura* COCKERELL, 1918. (Original designation.)

Proposed as a subgenus of *Ceratina* Latreille.

Chlorosmia SLADEN.

Can. Ent., vol. 48, p. 270, 1916.

Type.—(*Osmia*) *Chlorosmia fulgida* (CRESSON), 1864. (Monobasic.)

Chromobombus DALLA TORRE.

Die Naturhistoriker, vol. 2, p. 40, 1880. Four species.

Type.—*Apis muscorum* LINNAEUS, 1758. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Chrysandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 211, 1933. Eleven species.

Type.—(*Apis*) *Andrena fulvago* (CHRIST), 1791. (Original designation.)

(Chrysantheda PERTY) = Exaerete HOFFMANNSEGG.

Delectus animalium articulorum . . . Brasilliam, p. 147, 1833.

Type.—(*Chrysantheda nitida* PERTY, 1833) = (*Apis*) *Exaerete dentata* (LINNAEUS), 1758. (Monobasic.)

Isogenotypic with *Caliendra* Gistel and through synonymy with *Exaerete* Hoffmannsegg.

Chrysopheon TITUS.

Can. Ent., vol. 33, p. 256, 1901.

Type.—*Chrysopheon aurifuscus* TITUS, 1901. (Monobasic.)

Cilissa LEACH.

Edinburgh Encycl., vol. 9, p. 155, 1815. Two species.

Type.—(*Andrena haemorrhoidalis* PANZER, 1799) = *Andrena haemorrhoidalis* FABRICIUS, 1775. (By designation of Westwood, An introduction to the modern classification of insects, vol. 2; Synopsis of the genera of British insects, p. 84, 1840.) (*Melitta*) *Cilissa tricolorata* (Kirby), 1802, was designated by Taschenberg, Berlin Ent. Zeitschr., vol. 27, p. 53, 1883.

Synonym of *Melitta* Kirby, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 187, 1886.

Cingulata MÉHELY.

Naturgeschichte der Urbliesen, pp. 43 and 149, 1935.

Type.—*Vespa pratensis* FOURCROY, 1785. (Monobasic.)

Proposed as a subgenus of *Prosopis* Fabricius.

Synonym of *Prosopis* Fabricius, according to Popov, Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Gladocerapis COCKERELL.

Ent. News, vol. 15, p. 292, 1904.

Type.—*Lamprocolletes cladocerus* F. SMITH, 1862. (Monobasic and original designation.)

Claremontiella COCKERELL.

Pan-Pacific Ent., vol. 9, p. 25, 1933.

Type.—*Spinoliella euzantha* COCKERELL, 1916. (Monobasic and original designation.)

Proposed as a subgenus of *Spinoliella* Ashmead.

Clavicerca LATREILLE (= *Ceratina* LATREILLE).

Histoire naturelle de fourmis, p. 432, 1802.

Type.—(*Hylaeus albilabris* FABRICIUS, 1793) = *Apis cucurbitina* ROSSI, 1792. (Monobasic.)

Although Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 195, 1896, cites *Clavicerca* as a synonym of *Ceratina* Latreille, the former name has priority. Richards, The generic names of British insects, pt. 5, p. 91, 1937, has proposed that the name *Clavicerca* Latreille be set aside and have no status in nomenclature and that *Ceratina* be retained.

Clisodon PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 479, 1879. Two species.

Type.—*Anthophora terminalis* CRESSON, 1869. (Original designation.)

Cnemidandrena HEDIOKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 212, 1933. Thirteen species.

Type.—(*Melitta*) *Andrena nigriceps* (KIRBY), 1802. (Original designation.)

(Cnemidium PERTY, not GOLDFUSS, 1826) = *Euglossa* LATREILLE.

Delectus animalium articulatum . . . Brasiliam, p. 148, 1833.

Type.—(*Cnemidium viride* PERTY, 1833) = (*Apts*) *Euglossa cordata* (LINNAEUS), 1758. (Monobasic.)

Isogenotypic with *Euglossa* Latreille through synonymy.

Cnemidium Perty is preoccupied, but since it is a synonym of *Euglossa* Latreille, no new name is proposed to replace it.

Coccineobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes, Petrograd, vol. 4, p. 157, 1922. Three species.

Type.—(*Bombus*) *Alpigenobombus* (*Coccineobombus*) *coccineus* (FRIESE), 1903. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Alpigenobombus* Skorokov.

Cockerellia ASHMEAD.

Psyche, vol. 8, p. 284, 1898.

Type.—*Perdita hyalina* CRESSON, 1878. (Monobasic and original designation.)

Cockerellula STRAND (= *Lutziella* COCKERELL, 1922, not ENDERLEIN, 1922).

Folia Zool. Hydrobiol., Riga, vol. 4, p. 196, 1932.

Type.—*Perdita* (*Lutziella*) *opuntiae* COCKERELL, 1922. (Autobasic.)

Coelioxoides CRESSON.

Trans. Amer. Ent. Soc., vol. 7, p. 94, 1878.

Type.—*Coelioxoides punctipennis* CRESSON, 1878. (Monobasic.)

Coelioxys LATREILLE.

Genera crustaceorum et insectorum, vol. 4, p. 166, 1809. Two species.

Type.—(*Anthophora conica* FABRICIUS, 1804 = *Apis conica* LINNAEUS, 1758) = *Apts quadridentata* LINNAEUS, 1758. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.)

(*Colax* LEPELETIER "inedit." not HÜBNER, 1819, not WIEDEMANN, 1824) = *Rhathymus* LEPELETIER AND SERVILLE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, pp. 4 and 213, 1825. No species.

Colletes LATREILLE (= *Evodia* PANZER).

Histoire naturelle de fourmis, p. 423, 1802.

Type.—*Apis succincta* LINNAEUS, 1758. (Monobasic.)

Isogenotypic with *Evodia* Panzer through synonymy.

Compsomelissa ALFKEN.

Denkschr. Akad. Wiss. Wien, Math.-naturw. Klasse, vol. 99, p. 251, 1924.

Type.—*Compsomelissa bürneri* ALFKEN, 1924. (Monobasic.)

Conandrena VIERECK.

Can. Ent., vol. 56, p. 20, 1924.

Type.—*Andrena bradleyi* VIERECK, 1907. (Monobasic and original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Conanthalictus COCKERELL.

Ent. News, vol. 12, p. 209, 1901.

Type.—*Halictus (Conanthalictus) conanthi* COCKERELL, 1901. (Monobasic.)

Proposed as a subgenus of *Halictus* Latreille.

Confusibombus BALL (= *Sulcobombus* KRÜGER).

Ann. Soc. Ent. Belgique, vol. 58, p. 78, 1914.

Type.—*Bombus confusus* SCHENCK, 1859. (Monobasic.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Sulcobombus* Krüger.

Conohalictoides VIERECK.

Ent. News, vol. 15, pp. 245 and 261, 1904.

Type.—*Conohalictoides lovelli* VIERECK, 1904. (Monobasic and original designation.)

(*Coptorthosoma* Pérez) for *Koptortosoma* GRIBODO.

Actes Soc. Linn. Bordeaux, ser. 6, vol. 6, p. 3, 1901.

Coquillettapis VIERECK.

Proc. Ent. Soc. Washington, vol. 11, p. 47, 1909.

Type.—(*Coquillettapis melittoides* VIERECK, 1909) = (*Melissodes*) *Diadasia nigrifrons* (CRESSON), 1878. (Monobasic and original designation.)

Synonym of *Diadasia* Patton, according to Cockerell, Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 671, 1911.

(*Corbicula* FRIESE, not MEGERLE, 1811) = *Canephorula* JÖRGENSEN.

Flora og Fauna Aarhøg, vol. 10, p. 59, 1908.

Type.—*Corbicula apiformis* FRIESE, 1908. (Monobasic.)

(*Corynogaster* SICHEL) = *Corynura* SPINOLA.

Novara-Expedition. Zoologischer Theil, vol. 2, Hymenoptera, Fossoria et Mellifera. Suppl. p. 146, 1867. Two species.

Type.—*Halictus (Corynura) gayi* SPINOLA, 1851. (Present designation.)

Isogenotypic with *Corynura* Spinola and *Manuelia* Vachal.

Corynura SPINOLA (= *Corynogaster* SICHEL; *Manuelia* VACHAL).

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 296, 1851. Two species.

Type.—*Halictus (Corynura) gayi* SPINOLA, 1851. (Present designation.)

Proposed as a subgenus of *Halictus* Latreille.

Isogenotypic with *Corynogaster* Sichel and *Manuelia* Vachal.

Corynuroides, new name (= *Corynuropsis* COCKERELL, 1901, not SCOTT, 1894).

Type.—*Corynura (Corynuropsis) darwini* Cockerell, 1901. (Autobasic.)

(*Corynuropsis* COCKFELL, not SCOTT, 1894) = *Corynuroides*, new name.

Proc. Acad. Nat. Sci. Philadelphia, vol. 53, p. 220, 1901. Two species.

Type.—*Corymura* (*Corynuropsis*) *darwini* COCKERELL, 1901. (Original designation.)

Proposed as a subgenus of *Corymura* Spinola.

Corythochila MICHENER.

Amer. Midland Nat., vol. 22, pp. 8 and 75, 1939. Two species.

Type.—*Ashmeadiella* (*Corythochila*) *inyoensis* MICHENER, 1939. (Original designation.)

Proposed as a subgenus of *Ashmeadiella* Cockerell.

Creightonella COCKERELL.

Entomologist, vol. 41, p. 146, 1908. Two species.

Type.—*Megachile* (*Creightonella*) *mitimia* COCKERELL, 1908. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Cressoniella MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 302, 305, 307, and 310, 1934. Four species.

Type.—*Megachile zapoteca* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Crewella COCKFELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 202, 1903.

Type.—*Ceratina* (*Crewella*) *titusi* COCKERELL, 1903. (Monobasic and original designation.)

Proposed as a subgenus of *Ceratina* Latreille.

Crinoglossa FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 49, p. 502, 1925.

Type.—*Crinoglossa natalensis* FRIESE, 1925. (Monobasic.)

(*Crocisa* JURINE) = *Thyreus* PANZER.

Erlangen Literatur-Zeitung, vol. 1, p. 164, 1801. Three species.

Type.—*Nomada scutellata* JURINE, 1801, which according to Morice and Durrant, is equivalent to (*Melecta histrionica* ILLIGER, 1806) = *Nomada scutellaris* FABRICIUS, 1781. (By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 423, 1915.)

Isogenotypic with *Thyreus* Panzer and *Crocissa* Panzer through synonymy. Invalid under Opinion 135 of the International Commission on Zoological Nomenclature.

Crocisaspidia ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 68, 1899.

Type.—*Crocisaspidia chandleri* ASHMEAD, 1899. (Monobasic and original designation.)

(*Crocissa* PANZER) = *Thyreus* PANZER.

Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 263, 1806.

Type.—*Nomada scutellaris* FABRICIUS, 1781. (Present designation.)

Isogenotypic with *Thyreus* Panzer.

Cryptohalictoides VIEBECK.

Ent. News, vol. 15, p. 261, 1904.

Type.—*Cryptohalictoides spiniferus* VIEBECK, 1904. (Monobasic and original designation.)

Ctenioschelus ROMAND (= *Melissoda* LEPELETIER).

Rev. Zool., p. 336, 1840.

Type.—*Acanthopus goryi* ROMAND, 1840. (Monobasic.)

Isogenotypic with *Melissoda* Latreille through synonymy.

Synonym of *Acanthopus* Klug, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 325, 1896.

Ctenoapis CAMERON.

Ann. Mag. Nat. Hist., ser. 7, vol. 8, p. 116, 1901. Two species.

Type.—*Ctenoapis lutea* CAMERON, 1901. (Present designation.)

Ctenocolletes COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 3, p. 358, 1929.

Type.—*Stenotritus* (*Ctenocolletes*) *nicholsoni* COCKERELL, 1929. (Monobasic.)

Proposed as a subgenus of *Stenotritus* F. Smith.

Ctenocorynura SCHROTTKY.

Deutsche Ent. Zeitschr., p. 628, 1914.

Type.—*Ctenocorynura vernoniae* SCHROTTKY, 1914. (Monobasic and original designation.)

Ctenonomia CAMERON.

Journ. Straits Branch Roy. Asiatic Soc., vol. 39, p. 178, 1903.

Type.—*Ctenonomia carinata* CAMERON, 1903. (Monobasic.)

Synonym of *Halictus* Latreille, according to Blüthgen, Deutsche Ent. Zeitschr., p. 419, 1925.

Ctenoplectra KIRBY (=Ctenoplectra F. SMITH, 1858).

In Kirby and Spence, An introduction to entomology, vol. 3, p. 681, 1826. No species.

Type.—*Ctenoplectra chalybea* F. SMITH, 1858. (Present designation; first species included.)

Proposed as a "subgenus near *Saropoda*" Latreille.

Isogenotypic with *Ctenoplectra* F. Smith.

Since the only character given by Kirby for *Ctenoplectra* (the crescent-shaped inner calcar of the hind tibia, with its inner edge finely pectinate) is in agreement with Smith's description and illustration of that structure in his species *chalybea*, that species is transferred to *Ctenoplectra* Kirby and designated its type. Apparently *Ctenoplectra* Kirby has, until now, been a genus without species.

(Ctenoplectra F. SMITH)=Ctenoplectra KIRBY.

Journ. Proc. Linn. Soc. London, Zool., vol. 2, p. 44, 1858.

Type.—*Ctenoplectra chalybea* F. SMITH, 1858. (Monobasic.)

Isogenotypic with *Ctenoplectra* Kirby.

Ctenoplectrella COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, pp. 13 and 19, 1909.

Type.—*Ctenoplectrella viridiceps* COCKERELL, 1909. (Monobasic.)

Ctenoplectrina COCKERELL.

Rev. Zool. Bot. Africales, vol. 18, p. 360, 1930.

Type.—*Ctenoplectra* (*Ctenoplectrina*) *politula* COCKERELL, 1930. (Monobasic and original designation.)

Proposed as a subgenus of *Ctenoplectra* F. Smith.

(Ctenopoda MA, not McATEE AND MALLOCH, 1933)=BAANA, new name.

Rec. Indian Mus., vol. 40, pp. 270 and 285, 1938. Two species.

Type.—*Apis fenestrata* FABRICIUS, 1798. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

(Ctenosmia THOMSON)=Hoplitis KLUG.

Hymenoptera Scandinaviae, vol. 2, p. 233, 1872. Two species.

Type.—*Apis adunca* PANZER, 1798. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 158, 1941.)

Proposed as a subgenus of *Osmia* Panzer.

Isogenotypic with *Hoplitis* Klug.

Cubitalia FRIESE.

Arch. Naturg., Jahrg. 77, Bd. 1, p. 136, 1911.

Type.—*Eucera* (*Cubitalia*) *breviceps* FRIESE, 1911. (Monobasic.)

Proposed as a subgenus of *Eucera* Scopoli.

Cubitognatha MICHENER.

Amer. Midland Nat., vol. 22, pp. 9 and 81, 1939.

Type.—*Ashmeadiella* (*Cubitognatha*) *ænomastus* MICHENER, 1939. (Monobasic and original designation.)

Proposed as a subgenus of *Ashmeadiella* Cockerell.

Cullumanobombus VOGT.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 57, 1911. Four species.

Type.—(*Apis*) *Bombus cullumanus* (KIRBY), 1802. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 66, 1927.)

Proposed as a subgenus of *Bombus* Latreille.

Curtisapis ROBERTSON.

Ent. News, vol. 29, p. 91, 1918. Three species.

Type.—*Halictus coriaceus* F. SMITH, 1853. (Original designation.)

Cyaneoderes ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 70, 1899. Two species.

Type.—(*Cyaneoderes fairchildi* ASHMEAD, 1899) = (*Bombus*) *Xylcopa cocerulea* (FABRICIUS), 1804. (Original designation.)

Cyanocentris FRIESE.

Ann. naturhist. Hofmus. Wien, vol. 15, p. 243, 1900. Thirty-seven species.

Type.—(*Apis*) *Centris versicolor* (FABRICIUS), 1775. (Present designation.)

Proposed as a subgenus of *Centris* Fabricius.

Cyathocera F. SMITH.

Trans. Ent. Soc. London, p. 47, 1875.

Type.—*Cyathocera nodicornis* F. SMITH, 1875. (Monobasic.)

Synonym of *Steganomus* Ritsema, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 163, 1896.

Cyphomelissa SCHROTTKY.

Rev. Mus. Paulista, vol. 5, p. 493, 1903.

Type.—*Cyphomelissa pernigra* SCHROTTKY, 1903) = (*Melissa*) *Hopliophora diabolica* (FRIESE), 1900. (Monobasic and original designation.)

Synonym of *Hopliophora* Lepeletier, according to Friese, Zeitschr. Syst. Hym. Dipt., vol. 8, p. 47, 1908.

Cyphopyga ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 169 and 172, 1903.

Type.—*Megachile montivaga* CRESSON, 1878. (Monobasic and original designation.)

Synonym of *Anthemois* Robertson according to Mitchell, Trans. Amer. Ent. Soc., vol. 61, p. 155, 1934, which is isogenotypic through synonymy with *Megachile* Latreille.

Cyrtapis COCKERELL [fossil].

Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 339, 1908.

Type.—*Cyrtapis anomalus* COCKERELL, 1908. (Monobasic.)

Dactylandrena VIERECK.

Can. Ent., vol. 56, p. 20, 1924.

Type.—*Andrena* (*Dactylandrena*) *maura* VIERECK, 1924. (Monobasic and original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Dactylurina COCKERELL.

Rev. Zool. Bot. Africales, vol. 26, p. 47, 1934.

Type.—*Trigona staudingeri* GRIBODO, 1893. (Monobasic and original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Dasiapis COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 450, 1903.

Type.—*Dasiapis ochracea* COCKERELL, 1903. (Monobasic.)

Dasycolletes F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 14, 1853.
Two species.

Type.—*Dasycolletes metallicus* F. SMITH, 1853. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 31, p. 347, 1905.)

Synonym of *Paracolletes* F. Smith, according to Cockerell (loc. cit., p. 344).

(Dasyglossa ILLIGER) = Ozaea KLUG.

Magazin für Insektenkunde, vol. 6, p. 217, 1807. Two specific names mentioned, but species not described.

In KLUG, Mag. Ges. naturf. Freunde Berlin, vol. 4, p. 44, 1810. Three species.

Type.—*Ozaea flavescens* KLUG, 1807. (Present designation.)

Isogenotypic with *Ozaea* Klug.

Dasyglossa LATREILLE (=Podasys RAFINESQUE).

Histoire naturelle de fourmis, p. 424, 1802. Two species.

Type.—*Andrena hirtipes* FABRICIUS, 1793. (By designation of Blanchard, Histoire naturelle des insectes . . . , vol. 3, p. 414, 1840.) *Melitta swammerdamella* Kirby, 1802, designated by Curtis, Brit. Ent., vol. 8, p. 367, 1831, was not originally included but is a synonym of *hirtipes*.

Delomegachile VIERECK.

Bull. Conn. Geol. Nat. Hist. Surv., vol. 22, p. 745, 1916.

Type.—(*Megachile vidua* F. SMITH, 1853) = *Megachile frigida* F. SMITH, 1853. (Monobasic.)

Proposed as a subgenus of *Megachile* Latreille.

Denticolletes NOSKIEWICZ.

Die palarktischen Colletes-arten, pp. 25 and 486, 1936.

Type.—*Colletes graeffei* ALFKEN, 1900. (Monobasic.)

Proposed as a subgenus of *Colletes* Latreille.

Dentigera MÉHELY.

Naturgeschichte der Urbielen, pp. 45 and 151, 1935. Five species. Invalid under Article 25c of the International Rules of Zoological Nomenclature, since no type was designated.

Dentigera POPOV (=Imperfecta POPOV).

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., n. ser., vol. 25, p. 168, 1939.
Four species.

Type.—(*Hylaeus*) *Prosopis brevicornis* (NYLANDER), 1852. (Original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Isogenotypic with *Imperfecta* Popov.

Dentigera was first proposed by Méhely, Naturgeschichte der Urbielen, pp. 45 and 151, 1935, as a subgenus of *Prosopis* Fabricius to include five species, but since no genotype was designated *Dentigera* has no validity as of that date under Article 25c of the International Rules.

Deranchylaeus BRIDWELL.

Proc. Hawaiian Ent. Soc., vol. 4, p. 136, 1919. Many species.

Type.—*Prosopis curvicastrata* CAMERON, 1905. (Original designation.)

Derotropis MITCHELL.

Trans. Amer. Ent. Soc., vol. 62, pp. 118, 119, and 156, 1936. Seven species.

Type.—*Megachile* (*Xeromegachile*) *pascoensis* MITCHELL, 1934. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

(Desmotetrapedia SCHROTTKY) = Chalepogenus HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 68, p. 223, 1909. Two species.

Type.—*Tetrapedia muelleri* FRIESE, 1899. (Original designation.)

Isogenotypic with *Chalepogenus* Holmberg through synonymy, according to Cockerell, Journ. New York Ent. Soc., vol. 22, p. 320, 1914.

Diadasia PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 475, 1879. Three species.

Type.—*Melissodes cnavata* CRESSON, 1872. (Original designation.)

Diadasella ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 64, 1899.

Type.—*Diadasella coquilletti* ASHMEAD, 1899. (Monobasic and original designation.)

Synonym of *Anthrophorula* Cockerell, according to Cockerell and Porter, Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 406, 1899.

Diagonozus ENDERLEIN.

Berlin. Ent. Zeitschr., vol. 48, p. 35, 1903.

Type.—*Diagonozus bicometes* ENDERLEIN, 1903. (Monobasic.)

Dialictus ROBERTSON

Can. Ent., vol. 34, p. 48, 1902.

Type.—*Halictus anomalus* ROBERTSON, 1892. (Monobasic and original designation.)

Dialonia ROBERTSON.

Ent. News, vol. 14, p. 104, 1903.

Type.—*Sphcodes antennariae* ROBERTSON, 1891. (Monobasic and original designation.)

Diandrena COCKERELL.

Psyche, vol. 10, p. 75, 1903. Three species.

Type.—*Panurgus chalybaeus* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Dianthidium COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 5, p. 412, 1900. Four species.

Type.—*Anthidium curvatum* F. SMITH, 1854. (Original designation.) *Dianthidium sayi* Cockerell, 1907, was designated as type by Cockerell, Ent. Rec., vol. 21, p. 269, 1909, who accepted certain specimens rather than the species cited as the basis for the generic name. Approval by the International Commission would be required for the adoption of this view (Opinion 65).

Proposed as a subgenus of *Anthidium* Fabricius.

Diceratosima ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 166 and 171, 1903.

Type.—(*Osmia quadridentata* CRESSON, 1878) = *Osmia conjuncta* CRESSON, 1864. (Monobasic and original designation.)

(Dichroa ILLIGER) = Sphecodes LATREILLE.

Magazin für Insektenkunde, vol. 5, pp. 39 and 46, 1805 [1806]. Fourteen species.

Type.—*Spheca gibba* LINNAEUS, 1758. (Present designation.)

Isogenotypic with *Sphecodes* Latreille.

Didonia GRIBODO.

Bull. Soc. Ent. Italiana, vol. 26, p. 106, 1894.

Type.—*Didonia punica* GRIBODO, 1894. (Monobasic.)

Diepeolus GRIBODO.

Bull. Soc. Ent. Italiana, vol. 26, p. 80, 1894.

Type.—*Epeolus* (*Diepeolus*) *giannellii* GRIBODO, 1894. (Monobasic.)

Proposed as a subgenus of *Epeolus* Latreille.

Dieunomia COCKERELL (= *Eunomia* CRESSON, not HÜBNER, 1818, not LAMOUROUX, 1821, not RISSO, 1826).

Entomologist, vol. 32, p. 14, 1899.

Type.—*Eunomia marginipennis* CRESSON, 1875. (By designation of Cockerell, Proc. U. S. Nat. Mus., vol. 38, p. 290, 1910.)

Digronoceras COCKERELL.

Rev. Zool. Bot. Africaines, vol. 20, p. 134, 1931. Four species.

Type.—(*Megachile*) *Gronoceras combusta* (F. SMITH), 1853. (Original designation.)

Proposed as a subgenus of *Gronoceras* COCKERELL.

(Dilobopeltis FAIRMAIRE) = *Euasps* GERSTÄCKER.

Arch. Ent., vol. 2, p. 266, 1858.

Type.—(*Dilobopeltis fuscipennis* FAIRMAIRE, 1858) = (*Thynnus*) *Euasps adominalis* (FABRICIUS), 1793. (Monobasic.)

Isogenotypic with *Euasps* Gerstäcker through synonymy.

Dioxys LEPELETIER and SERVILLE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 109, 1825.

Type.—*Trachusa cincta* JUBINE, 1807. (Monobasic.)

Dipedia FRIESE.

Flora og Fauna Silkeborg, vol. 8, p. 92, 1906. Four species.

Type.—*Ancyloscelis armatus* F. SMITH, 1854. (By designation of Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 592, 1920.)

Synonym of *Leptergatis* Holmberg, according to Schrottky, Deutsche Ent. Zeitschr., p. 795, 1909.

Diphaglossa SPINOLA.

Historia física y política de Chile . . . por Claudio Gay, vol. 6, p. 168, 1851.

Type.—*Diphaglossa gayi* SPINOLA, 1851. (Monobasic.)

(Diphysis LEPELETIER) = *Trachusa* PANZER, 1804.

Histoire naturelle des insectes, Hyménoptères, vol. 2, p. 307, 1841.

Type.—(*Diphysis pyrenaica* LEPELETIER, 1841) = *Apis byssina* PANZER, 1798.

Isogenotypic with *Trachusa* Panzer, 1804, through synonymy.

Diversobombus SKORIKOV.

Rev. Russe Ent., vol. 14, p. 406, 1914. Two species.

Type.—*Bombus diversus* F. SMITH, 1869. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Doeringiella HOLMBERG.

Actas Acad. Nac. Cienc. Córdoba, vol. 5, p. 151, 1884.

Type.—*Doeringiella bizonata* HOLMBERG, 1884. (Monobasic.)

Synonym of *Epeolus* Latreille, according to Brèthes, Ann. Mus. Nac. Buenos Aires, ser. 3, vol. 12, p. 68, 1909.

Dolichocheile VIEBECK.

Proc. Ent. Soc. Washington, vol. 11, p. 49, 1909.

Type.—*Dolichocheile melittoides* VIEBECK, 1909. (Monobasic and original designation.)

Drepanium ROBERTSON.

Ent. News, vol. 14, p. 103, 1903.

Type.—*Sphecodes falcifer* PATTON, 1880. (Monobasic.)

Dufourea LEPELETIER.

Histoire naturelle des insectes, Hyménoptères, vol. 2, p. 227, 1841. Two species.

Type.—*Dufourea minuta* LEPELETIER, 1841. (By designation of Richards, Trans. Ent. Soc. London, vol. 83, p. 172, 1935.) *Dufourea vulgaris* Schenck, 1859, designated by Cockerell, Psyche, vol. 31, p. 244, 1924, was not originally included.

Echthralictus PERKINS AND CHEESMAN.

Insects of Samoa, part 5, fasc. 1, p. 14, 1928. Two species.

Type.—*Halictus extraordinarius* KOHL, 1908. (Original designation.)

Eclectica HOLMBERG.

Actas Acad. Nac. Cienc. Córdoba, vol. 5, p. 123, 1884.

Type.—*Eclectica tintinnans* HOLMBERG, 1884. (Monobasic.)

Synonym of *Melissodes* Latreille, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 220, 1909.

Egipista COCKERELL (= *Apista* F. SMITH, 1861; not HÜBNER, 1816).

Can. Ent., vol. 36, p. 357, 1904.

Type.—*Apista opalina* F. SMITH, 1861. (Autobasic.)

Electrapis COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, p. 7, 1909.

Type.—*Apis melliponoides* BUTTEL-REEFEN, 1906. (Monobasic and original designation.)

Emphor PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 476, 1879.

Type.—*Melissodes bombiformis* CRESSON, 1878. (Monobasic and original designation.)

Emphoropsis ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 60, 1899. No species.

Cockerell and Cockerell, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 48, 1901. Four species.

Type.—(*Anthophora*) *Habropoda floridana* (F. SMITH), 1854. (By designation of Cockerell and Cockerell, loc. cit.)

(**Energoponus** HOLMBERG) = *Ptilothrix* F. SMITH.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 406, 1903. Two species.

Type.—(*Energoponus strenuus* HOLMBERG, 1903) = *Ptilothrix plumatus* F. SMITH, 1853. (Present designation.)

Isogenotypic with *Ptilothrix* F. Smith through synonymy.

Ensliniana ALFKEN.

Deutsche Ent. Zeitschr., p. 431, 1938.

Type.—*Ensliniana cuspidata* ALFKEN, 1938. (Monobasic and original designation.)

Entechnia PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 476, 1879.

Type.—*Anthophora taurea* SAY, 1837. (Monobasic and original designation.)
Synonym of *Melitoma* Lepeletier and Serville, according to Vachal, Ann.

Soc. Ent. France, pp. 5 to 14, 1909.

Eopsithyrus POPOV.

Eos, vol. 7, p. 134, 1931. Two species.

Type.—(*Apathus*) *Psithyrus tibetanus* (MORAWITZ), 1886. (Original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Eothrincostoma BLÜTHGEN.

Mitt. Zool. Mus. Berlin, vol. 15, pp. 496, 499, and 501, 1930. Three species.

Type.—(*Halictus*) *Thrinchostoma torridum* (F. SMITH), 1879. (Present designation.)

Proposed as a subgenus of *Thrinchostoma* SAUSSURE.

Epicharis RADOSZKOWSKI (=Fiorentinia DALLA TORRE).

Horae Soc. Ent. Ross., vol. 18, p. 18, 1884.

Type.—*Epicharis mcvicanus* RADOSZKOWSKI, 1884. (Monobasic.)

Genotype transferred to *Tetrapedia* Klug by Friese, Zeitschr. Syst. Hym. Dipt., vol. 4, p. 100, 1904.

Synonym of *Tetrapedia* Klug, according to Cockerell, Trans. Amer. Ent. Soc., vol. 32, p. 105, 1906.

Epeoloides GIRAUD.

Verh. zool.-bot. Ges. Wien, vol. 13, p. 44, 1863.

Type.—(*Epeoloides ambiguus* GIRAUD, 1863) = (*Apis*) *Epeoloides coecutiens*, (FABRICIUS), 1775. (Monobasic.)

Epeolus LATREILLE.

Histoire naturelle de fourmis, p. 427, 1802.

Type.—(*Nomada variegata* FABRICIUS, 1775) = *Apis variegata* LINNAEUS, 1758. (Monobasic.)

Epicharis KLUG.

Magazin für Insektenkunde, vol. 6, pp. 197 and 226, 1807. Two species.

Type.—*Centris umbraculata* FABRICIUS, 1804. (By designation of Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 562, 1920.) (*Apis*) *Centris hirtipes* (Fabricius), 1793, designated by Latreille, Considérations générales . . . des insectes, p. 439, 1810, was not originally included in *Epicharis*, but is conspecific with *Centris dasypoda* [*dasypus*] Illiger, 1806, which was originally included. Both *hirtipes* Fabricius and *dasypoda* are synonyms of (*Apis*) *Epicharis rustica* (Olivier), 1789.

Epicharoides RADOSZKOWSKI.

Horae Soc. Ent. Ross., vol. 18, p. 20, 1884.

Type.—*Epicharoides bipunctatus* RADOSZKOWSKI, 1884. (Monobasic.)

Epiclopus SPINOLA.

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 183, 1851.

Type.—*Epiclopus gayi* SPINOLA, 1851. (Monobasic.)

Epihalictoides COCKERELL AND PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 420, 1899.

Type.—(*Panurgus*) *Halictoides marginatus* (CRESSON), 1878. (Monobasic.)

Proposed as a subgenus of *Halictoides* Nylander.

Epimelissodes ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 63, 1890.

Type.—*Melissodes atripes* (CRESSON, 1872. (Monobasic and original designation.)

Epimethea MORAWITZ.

Horae Soc. Ent. Ross., vol. 12, p. 61, 1876. Two species.

Type.—*Epimethea variegata* MORAWITZ, 1876. (By designation of Cockerell, Amer. Mus. Novit., No. 36, p. 1, 1922.)

Epimonispractor HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887. Nomen nudum.

Ann. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 426, 1903. Two species.

Type.—*Epimonispractor graciosus* HOLMBERG, 1903. (Original designation.)

Synonym of *Exomalopsis* Spinola, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 10 (ser. 3, vol. 12), p. 223, 1909.

Epinomia ASHMEAD.

Trans. Amer. Ent. Soc., vol. 23, p. 88, 1899.

Type.—(*Nomia persimilis* COCKERELL, 1898) = *Nomia triangulifera* VACHAL, 1897. (Monobasic and original designation.)

(*Eriades* DALLA TORRE AND FRIESE) for *Heriades* SPINOLA.

Ent. Nachr., vol. 21, p. 69, 1895.

Ericrocis CRESSON.

Trans. Amer. Ent. Soc., supplementary vol., pp. 131 and 134, 1887.

Type.—*Crocisca* ? *lata* CRESSON, 1878. (Monobasic.)

(*Eriops* KLUG) = *Panurgus* PANZER.

Magazin für Insektenkunde, vol. 6, p. 197, 1807.

Type.—(*Dasygoda lobata* FABRICIUS, 1804 = *Andrena lobata* PANZER, 1799) = *Apis calcarata* SCOPOLI, 1763. (Monobasic.)

Isogenotypic with *Panurgus* Panzer.

(*Eryops* LATREILLE) for *Eriops* KLUG.

Encycl. Méthod. Hist. Nat., Ins., vol. 8, p. 716, 1811.

Erythrosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, p. 20 [1886], 1884–86 [1885]. Two species.

Type.—*Osmia andrenoides* SPINOLA, 1808. (By designation of Cockerell, Amer. Mus. Novit., no. 40, p. 6, 1922.)

Proposed as a subgenus of *Osmia* Panzer.

Euandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 212, 1933. Many species.

Type.—*Andrena bicolor* FABRICIUS, 1775. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Euaspsis GERSTÄCKER (= *Dilobopeltis* FAIRMAIRE).

Monatsb. Akad. Wiss. Berlin, 1857, p. 461, 1858.

Type.—*Thymnus abdominalis* FABRICIUS, 1793. (Original designation.)

Isogenotypic with *Dilobopeltis* Fairmaire through synonymy.

Eucara FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 5, p. 241, 1905. Four species.

Type.—*Anthophora* (*Eucara*) *laticeps* FRIESE, 1905. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 10, vol. 11, p. 456, 1933.)

Proposed as a subgenus of *Anthophora* Latreille.

Eucera SCOPOLI.

Historico naturalis, annus 4, p. 8, 1770. Three species.

Type.—(*Eucera longicornis* FABRICIUS, 1793) = *Apis longicornis* LINNAEUS, 1758. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.)

Eucondylops BRAUNS.

Zeitschr. Syst. Hym. Dipt., vol. 2, p. 377, 1902.

Type.—*Eucondylops konowi* BRAUNS, 1902. (Monobasic.)

Eufriesea COCKERELL (= *Eumorpha* FRIESE, 1889, not HÜBNER, 1807, not ENDLICH, 1837).

Psyche, vol. 15, p. 41, 1909.

Type.—*Euglossa pulchra* F. SMITH, 1854. (Autobasic.)

Synonym of *Eulaema* Lepelletier, according to Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 544, 1920, which is isogenotypic with *Centris* Fabricius.

Euglages GERSTÄCKER.

Stettin. Ent. Zeitschr., vol. 30, p. 149, 1869.

Type.—*Euglages scripta* GERSTÄCKER, 1869. (Monobasic.)

Synonym of *Phiarus* Gerstaecker, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 500, 1896.

Euglossa LATREILLE (= *Cnemidium* PERTY; *Plusia* HOFFMANSEGG, 1817, not HÜBNER, 1806, not OCHSENHEIMER, 1816).

Histoire naturelle de fourmis, p. 436, 1802. Two species.

Type.—(*Euglossa cordata* FABRICIUS, 1804) = *Apis cordata* LINNAEUS, 1758.

(By designation of Blanchard, in Cuvier, Règne animal [ed. 3], insectes, text vol. 2, p. 219; atlas, pl. 129, fig. 2 [1849].)

Isogenotypic with *Cnemidium* Perty through synonymy.

Euerbstia FRIESE.

Stettin. Ent. Zeit., vol. 85, Heft 2, p. 8, 1925.

Type.—*Euerbstia excellens* FRIESE, 1925. (Monobasic.)

(*Eulaema* LEPELETIER; *Eulema* DALLA TORRE; *Eulaenia* SPINOLA) = *Centris* FABRICIUS.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 11, 1841. Seven species.

Type.—*Apis dimidiata* FABRICIUS, 1793. (By designation of Taschenberg, Berlin. Ent. Zeitschr., vol. 27, p. 85, 1883.)

Isogenotypic with *Centris* FABRICIUS.

(*Eulaenia* SPINOLA) for *Eulaema* LEPELETIER.

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 167, 1851.

(*Eulema* DALLA TORRE) for *Eulaema* LEPELETIER.

Catalogus hymenopterorum, vol. 10, p. 309, 1896.

Eulonchopria BRÈTHES.

Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 247, 1909.

Type.—*Eulonchopria psacanthioides* BRÈTHES, 1909. (Monobasic.)

Eumegachile FRIESE.

Term. Fuz., vol. 21, p. 198, 1898. No species.

Die Bienen Europas, vol. 5, p. 36, 1899. Seven species.

Type.—*Megachile bombycina* RADOSZKOWSKI, 1874. (By designation of Cockerell, Australian Zool., vol. 6, p. 209, 1930.)

Proposed as a subgenus of *Megachile* Latreille.

(*Eumorpha* FRIESE, not HÜBNER, 1807, not ENDLICHER, 1837) = *Eufriesea* COCKERELL.

Term. Fuz., vol. 22, p. 126, 1899. Eleven species.

Type.—*Euglossa pulchra* F. SMITH, 1854. (By designation of COCKERELL, Psyche, vol. 15, p. 41, 1908.)

Proposed as a subgenus of *Euglossa* Latreille.

(*Eunomia* CRESSON, not HÜBNER, 1818, not LAMOURBOUX, 1821, not Risso, 1826) = *Dieunomia* COCKERELL.

Rept. Geogr. Geol. Expl. & Surv. 100th Merid., vol. 5, p. 723, 1875. Three species.

Type.—*Eunomia marginipennis* CRESSON, 1875. (By designation of Cockerell, Proc. U. S. Nat. Mus., vol. 38, p. 290, 1910.)

Eunomioides BLÜTHGEN.

Soc. Sci. Fennica, Comm. Biol., vol. 6, No. 11, p. 3, 1937.

Type.—(*Andrena*) *Nomioides variegata* (OLIVIER), 1789. (Original designation.)

Proposed as a subgenus of *Nomioides* Schenck.

Eupalaeorhiza MEADE-WALDO.

Ann. Mag. Nat. Hist., ser. 8, vol. 13, p. 403, 1914.

Type.—*Eupalaeorhiza papuana* MEADE-WALDO, 1914. (Monobasic and original designation.)

Eupetersia BLÜTHGEN.

Deutsche Ent. Zeitschr., p. 49, 1928. Eleven species.

Type.—*Eupetersia neavei* BLÜTHGEN, 1928. (Original designation.)

Euprosopis PERKINS.

Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 106, 1912. Three species.

Type.—*Prosopis huscu* COCKERELL, 1910. (Original designation.)

Euryapis, new name (= *Orbitella* MA, 1938, not DONVILLE, 1915).

Type.—*Xylocopa confusa* PÉREZ, 1901. (Autobasic.)

Euryglossa F. SMITH.

Catalogue hymenopterous insects . . . British Museum, pt. 1, p. 16, 1853.

Three species.

Type.—*Euryglossa cupreochalybca* F. SMITH, 1853. (By designation of Meade-Waldo, Genera insectorum, fasc. 181, p. 6, 1923.)

Euryglossella COCKERELL.

Entomologist, vol. 43, p. 263, 1910.

Type.—*Euryglossella minima* COCKERELL, 1910. (Monobasic.)

Euryglossidia COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 6, p. 358, 1910. Two species.

Type.—*Euryglossidia rectangulata* COCKERELL, 1910. (Original designation.)

Euryglossimorpha STRAND.

Jahrb. Nassau. Ver. Naturk., vol. 63, p. 40, 1910.

Type.—*Euryglossa nigra* F. SMITH, 1879. (Monobasic.)

Proposed as a subgenus of *Euryglossa* F. Smith.

Euryglossina COCKERELL.

Trans. Amer. Ent. Soc., vol. 36, p. 211, 1910.

Type.—*Euryglossa semipurpurca* COCKERELL, 1910. (Monobasic.)

Proposed as a subgenus of *Euryglossa* F. SMITH.

Eurytis F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 279, 1854.

Type.—*Eurytis funereus* F. SMITH, 1854. (Monobasic.)

Synonym of *Hopliphora* Lepeletier, according to Ashmead, Trans. Amer. Ent. Soc., vol. 26, p. 67, 1899.

Eusynhalonia ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 63, 1899.

Type.—(*Melissodes*) *Synhalonia edwardsii* (CRESSON), 1878. (Monobasic and original designation.)

Synonym of *Tetralonia* Spinola, according to Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 615, 1920.

Euthyglossa RADOSZKOWSKI.

Hornae Soc. Ent. Ross., vol. 18, p. 21, 1884.

Type.—*Euthyglossa fasciata* RADOSZKOWSKI, 1884. (Monobasic.)

Genotype transferred to *Osiris* F. Smith by Friese, Zeitschr. Syst. Hym. Dipt., vol. 4, p. 100, 1904.

Synonym of *Osiris* F. Smith, according to Cockerell, Trans. Amer. Ent. Soc., vol. 32, p. 104, 1906.

Eutricharaea THOMSON (= *Paramegachile* FRIESE).

Hymenoptera Scandinaviae, vol. 2, p. 228, 1872.

Type.—*Apis argentata* FABRICIUS, 1793. (Monobasic.)

Proposed as a subgenus of *Megachile* Latreille.

Isogenotypic with *Paramegachile* Friese.

(*Evodia* PANZER) = *Colletes* LATREILLE.

Kritische Revision der Insektenfauna Deutschlands . . . vol. 2, p. 207, 1806.

Type.—(*Apis calendarum* PANZER, 1801) = (*Apis*) *Colletes succincta* (LINNAEUS), 1758. (Monobasic.)

Isogenotypic with *Colletes* Latreille through synonymy.

Evylaeus ROBERTSON.

Can. Ent., vol. 34, pp. 244, 245, and 247, 1902. Seven species.

Type.—*Halictus arcuatus* ROBERTSON, 1893. (Original designation.)

Exaerete HOFFMANNSEGG (= *Chrysantheda* PERTY; *Callendra* GISTEL).

Zool. Mag., vol. 1, p. 53, 1817.

Type.—(*Euglossa dentata* FABRICIUS, 1804) = *Apis dentata* LINNAEUS, 1758. (Monobasic.)

Isogenotypic with *Callendra* Gistel and *Chrysantheda* Perty through synonymy.

Exilobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd., vol. 3, p. 150, 1922.

Type.—(*Mucidobombus* (*Exilobombus*) *exil* SKORIKOV, 1922) = *Bombus nymphae* SKORIKOV, 1909. (Monobasic.)

Proposed as a subgenus of *Mucidobombus* Skorikov.

Skorikov gives no reason for his change of the name *nymphae* to *exil*, and unless *Bombus nymphae* Skorikov is a homonym it must stand with *exil* as a synonym.

Exomalopsis SPINOLA.

Mem. Reale Accad. Sci. Torino, ser. 2, vol. 13, p. 89, 1853. Four species.

Type.—(*Exomalopsis fulvopilosa* SPINOLA, 1853) = *Exomalopsis aureopilosa* SPINOLA, 1853. (By designation of Taschenberg, Berlin, Ent. Zeitschr., vol. 27, p. 82, 1883.)

Exoneura F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 232, 1854.

Type.—*Exoneura bicolor* F. SMITH, 1854. (Monobasic.)

Exoneuridia COCKERELL.

Ann. Mag. Nat. Hist. ser. 8, vol. 7, p. 232, 1911.

Type.—*Exoneura libanensis* FRIESE, 1899. (Monobasic and original designation.)

Proposed as a subgenus of *Exoneura* F. Smith.

Fasciata MÉHELY.

Naturgeschichte der Urblienen, pp. 44 and 140, 1935. Two names.

Proposed as a subgenus of *Prosopis* FABRICIUS.

Synonym of *Prosopis* Fabricius according to Popov, Compt. Rend. (Doklady) Acad. Sci., U. R. S. S., new ser. vol. 25, p. 168, 1939.

Invalid under Article 25c of the International Rules of Zoological Nomenclature, since no genotype was designated.

(*Fascista* POPOV) for *Fasciata* MÉHELY.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Fernaldaepsithyrus FRISON.

Trans. Amer. Ent. Soc., vol. 53, p. 70, 1927.

Type.—*Psithyrus fernaldae* FRANKLIN, 1911. (Monobasic and original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Fertonella COCKERELL (= *Pérezia* FERTON, not LEGER and DUBOSCQ, 1909).

Ann. Durban Mus., vol. 2, p. 257, 1920.

Type.—*Pérezia maura* FERTON, 1913. (Autobasic.)

Fervidobomus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 153, 1922. Thirty-two species.

Type.—(*Apis*) *Bremus fervidus* (FABRICIUS), 1798. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 69, 1927.)

Fidelia FRIESE.

Ann. naturhist. Hofmus. Wien. vol. 14, p. 244, 1899.

Type.—*Fidelia paradoxa* FRIESE, 1899. (Monobasic.)

(*Florentinia* DALLA TORRE) = *Epeicharis* RADOSZKOWSKI.

Catalogus hymenopterorum, vol. 10, p. 334, 1896.

Type.—*Epeicharis mexicanus* RADOSZKOWSKI, 1884. (Autobasic.)

Proposed for *Epeicharis* Radoszkowski, not *Epicharis* Klug.

Florilegus ROBERTSON.

Trans. Acad. Sci. St. Louis, vol. 10, p. 53, 1900.

Type.—*Melissodes condigna* CRESSON, 1878. (Monobasic.)

Formicapis SLADEN.

Can. Ent., vol. 48, p. 271, 1916.

Type.—*Formicapis clypeata* SLADEN, 1916. (Monobasic.)

Fraternobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 156, 1922. Three species.

Type.—(*Apathus*) *Alpigenobombus* (*Fraternobombus*) *fraternus* (F. SMITH), 1854. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 63, 1927.)

Proposed as a subgenus of *Alpigenobombus* Skorikov.

(*Friesea* SCHROTTKY, not DALLA TORRE, 1895) = *Parafriesea* SCHROTTKY.

Rev. Mus. Paulista, vol. 5, p. 418, 1903. (Monobasic.)

Type.—(*Friesea brasiliensis* SCHROTTKY, 1903) = (*Calliopsis*) *Camptopoeum flavifrons* (F. SMITH), 1853.

Synonym of *Camptopoeum* Spinola, according to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 86, 1912.

Friesemelitta IHERING.

Zeitschr. wiss. Insektenbiol., vol. 8, p. 5, 1912.

Type.—*Trigona silvestrii* FRIESE, 1902. (Monobasic.)

Funebribombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes, Petrograd, vol. 4, p. 157, 1922.

Type.—(*Bombus*) *Alpigenobombus* (*Funebribombus*) *funebris* (F. SMITH), 1854. (Monobasic.)

Proposed as a subgenus of *Alpigenobombus* Skorikov.

(*Furcosmia* SCHMIEDEKNECHT) = *Anthocopa* LEPELETIER AND SERVILLE.

Apidae Europaeae, vol. 2, p. 22 [888], 1884-86 [1885]. Five species.

Type.—*Apis papaveris* LATREILLE, 1799. (By designation of Cockerell, Amer. Mus. Novitates, no. 40, p. 6, footnote, 1922.)

Isogenotypic with *Anthocopa* Lepeletier and Serville and *Phyllotoma* Duméril.

Proposed as a subgenus of *Osmia* Panzer.

Gastrohalictus DUCKE.

Zeitschr. Syst. Hym. Dipt., vol. 2, p. 102, 1902.

Type.—*Halictus* (*Gastrohalictus*) *osmioides* DUCKE, 1902. (Monobasic.)

Proposed as a subgenus of *Halictus* Latreille.

Gastropsis F. SMITH (=Oestropsis F. SMITH, 1868, not BRAUER, 1868).

Trans. Ent. Soc. London, Proc. p. xxxix, 1868.

Type.—*Oestropsis pubescens* F. SMITH, 1868. (Autobasic.)

Synonym of *Stenotritus* F. Smith, according to Cockerell, Ann. Mag. Nat. Hist., ser. 10, vol. 3, p. 358, 1929.

Geoperdita COCKERELL AND PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 415, 1899.

Type.—*Perdita chamaesarachae* COCKERELL, 1896. (Monobasic.)

Proposed as a subgenus of *Perdita* F. Smith.

Glossoperdita COCKERELL.

Pomona Journ. Ent. Zool., vol. 8, p. 43, 1916.

Type.—*Perdita (Glossoperdita) pelargoides* COCKERELL, 1916. (Monobasic.)

Proposed as a subgenus of *Perdita* F. Smith.

Glossura COCKERELL.

Can. Ent., vol. 49, p. 144, 1917. Two species.

Type.—*Euglossa piliventris* GUÉRIN, 1845. (Original designation.)

Proposed as a subgenus of *Euglossa* Latreille.

Glyphandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 213, 1933. Seven species.

Type.—(*Apis*) *Andrena carbonaria* (LINNAEUS), 1767. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Glyptapis COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, p. 13, 1909. Four species.

Type.—*Glyptapis mirabilis* COCKERELL, 1909. (Original designation.)

Gnathias ROBERTSON.

Can. Ent., vol. 35, pp. 173, 174, and 175, 1903. Thirteen species.

Type.—*Nomada bella* CRESSON, 1863. (Original designation.)

(**Gnathocera** PROVANCHER, not KIRBY, 1825)=**Sayapis** TITUS.

Nat. Can., vol. 13, p. 232, 1882.

Type.—(*Gnathocera cephalica* PROVANCHER, 1882)=*Megachile (Sayapis) pugnatus* SAY, 1837. (Monobasic.)

Isogenotypic with *Sayapis* Titus and through synonymy with *Ceratias* Robertson.

(**Gnathodon** ROBERTSON, not OKEN, 1816, not SOWERBY, 1832, not STREUBEL, 1842, not JARDINE, 1845)=**Sarogaster** ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 168 and 192, 1903.

Type.—*Megachile georgica* CRESSON, 1878. (Monobasic and original designation.)

Synonym of *Chelostomoides* ROBERTSON, according to Mitchell, Trans. Amer. Ent. Soc., vol. 63, p. 396, 1937.

(**Gnathopasites** LINSLEY AND MICHENER)=**Neopasites** ASHMEAD.

Trans. Amer. Ent. Soc., vol. 63, p. 272, 1939.

Type.—*Phileremus fulviventris* CRESSON, 1878. (Monobasic and original designation.)

Isogenotypic with *Neopasites* Ashmead.

Gnathoprosopis PERKINS.

Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 104, 1912. Two species.

Type.—(*Prosopis wanthopoda* COCKERELL, 1910, not Vachal, 1895)=*Prosopis euwantha* COCKERELL, 1910. (Original designation.)

Gnathosmia ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 165 and 171, 1903.

Type.—*Osmia georgica* CRESSON, 1878. (Monobasic and original designation.)

Synonym of *Chalcosmia* Schmiedeknecht, according to Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 13, 1939.

Gnathylaeus BRIDWELL.

Proc. Hawaiian Ent. Soc., vol. 4, p. 133, 1919.

Type.—*Gnathylaeus williamsi* BRIDWELL, 1919. (Monobasic and original designation.)

Gonandrena VIERECK.

Trans. Amer. Ent. Soc., vol. 43, p. 390, 1917.

Type.—*Andrena* (*Gonandrena*) *persimulata* VIERECK, 1917. (Monobasic.)

Proposed as a subgenus of *Andrena* Fabricius.

Goniocolletes COCKERELL.

Bull. Amer. Mus. Nat. Hist., vol. 23, p. 231, 1907.

Type.—*Goniocolletes morsus* COCKERELL, 1907. (Monobasic and original designation.)

Greeleyella COCKERELL.

Entomologist, vol. 37, p. 235, 1904.

Type.—*Greeleyella beardsleyi* COCKERELL, 1904. (Monobasic and original designation.)

Synonym of *Panurginus* NYLANDER, according to Crawford, Proc. Ent. Soc. Washington, vol. 28, p. 208, 1926.

Gronoceras COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 20, p. 65, 1907. Six species.

Type.—(*Gronoceras wellmanni* COCKERELL, 1907) = (*Megachile*) *Gronoceras bombiformis* (GERSTAECKER), 1857. (Original designation.)

(*Gundlachia* CRESSON, not PFEIFFER, 1849) = *Heterocentris* COCKERELL.

Proc. Ent. Soc. Philadelphia, vol. 4, p. 195, 1865.

Type.—(*Centris* ? *cornuta* CRESSON, 1865, not Fabricius, 1787) = *Centris difformis* F. SMITH, 1854. (Monobasic.)

Isogenotypic with *Rhodocentris* Friese.

Gymnandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 213, 1933. Eight species.

Type.—(*Apis*) *Andrena thoracica* (FABRICIUS), 1775. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

(Gymnus SPINOLA) = Stelis PANZER.

Insectorum liguriae species novae aut rariores . . . , vol. 2, p. 9, 1808.

Type.—(*Apis*) *Stelis aterrima* (PANZER), 1798, not CHRIST, 1791) = *Apis punctulatissima* KIRBY 1802. (Monobasic.)

Isogenotypic with *Stelis* Panzer, *Gyrodroma* Klug, and *Ceraplastes* Gistel. *Trachusa* Jurine, 1801, also isogenotypic with *Stelis*, has been invalidated by Opinion 135 of the International Commission of Zoological Nomenclature.

(Gyrodroma KLUG) = Stelis PANZER.

Magazin für Insektenkunde, vol. 6, p. 198, 1807.

Type.—(*Megilla aterrima* FABRICIUS, 1804 = *Apis aterrima* PANZER, 1798, not CHRIST, 1791) = *Apis punctulatissima* KIRBY, 1802. (Monobasic.)

Isogenotypic with *Stelis* Panzer, *Gymnus* Spinola, and *Ceraplastes* Gistel. *Trachusa* Jurine, 1801, also isogenotypic with *Stelis*, has been invalidated by Opinion 135 of the International Commission of Zoological Nomenclature.

(Gyrodroma THOMSON, not KLUG, 1807) = Heriades SPINOLA.

Hymenoptera Scandinaviae, vol. 2, p. 259, 1872. Two species.

Type.—(*Heriades*) *Gyrodroma nigricornis* (NYLANDER), 1848. (By designation of Cockerell, Proc. California Acad. Sci., vol. 14, p. 205, 1925.)

(Habrophora F. SMITH, not ERICHSON, 1846) = Habropoda F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 318, 1854. Two species.

Type.—(*Habrophora ezonata* F. SMITH, 1854) = *Tetralonia tarsata* SPINOLA, 1838. (By designation of Patton, Bull. U. S. Geol. Surv. Terr., vol. 5, p. 477, 1879.)

Isogenotypic with *Habropoda* F. Smith.

Habropoda F. SMITH (=Habrophora F. SMITH, 1854, not ERICHSON, 1846).

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 320, 1854.

Type.—(*Habrophora ezonata* F. SMITH, 1854) = *Tetralonia tarsata* SPINOLA, 1838. (Autobasic.)

Isogenotypic with *Habrophora* F. Smith.

Hackeriapis COCKERELL.

Ann. Mag. Nat. Hist., ser. 9, vol. 10, p. 267, 1922. Four species.

Type.—*Megachile rhodura* COCKERELL, 1906. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Halictanthrena DUCKE.

Zeitschr. Syst. Hym. Dipt., vol. 7, p. 364, 1907.

Type.—*Halictanthrena malpighiacearum* DUCKE, 1907. (Monobasic.)

Synonym of *Lonchopria* Vachal, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 247, 1909.

Halictoides NYLANDER.

Notis. Sällsk. Fauna Flora Fennica, vol. 1, p. 195, 1848. Two species.

Type.—*Halictoides dentiventris* NYLANDER, 1848. (By designation of Cockerell and Porter, Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 420, 1899.)

Halictomorpha SCHBOTTKY.

Rev. Mus. Paullista, vol. 8, p. 81, 1910.

Type.—*Halictomorpha phaedra* SCHBOTTKY, 1910. (Monobasic and original designation.)

Halictus LATREILLE.

Nouv. Dict. Hist. Nat., vol. 24, p. 182, 1804. Three species.

Type.—*Apis quadricincta* FABRICIUS, 1776. (By designation of Richards, Trans. Roy. Ent. Soc. London, vol. 83, p. 170, 1935.) *Hylaeus scarcinctus* Fabricius, 1775, designated by Latreille, Considérations générales . . . des insectes, p. 439, 1810, was not originally included; and *Melitta rubicunda* Kirby, 1802, designated by Curtis (Brit. Ent., vol. 10, p. 448a, 1833) was likewise not originally included.

Haplomelitta COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 13, p. 446, 1934. Two species.

Type.—*Rhinochaetula ogilviei* COCKERELL, 1932. (Original designation.)

Helicosmia THOMSON.

Hymenoptera Scandinaviae, vol. 2, p. 233, 1872. No species.

Schmiedeknecht, Apidae Europaeae, vol. 2, p. 22 [883], 1884–86 [1885]. Seven species.

Type.—*Apis aurulenta* PANZER, 1799. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 163, 1941.)

Proposed as a subgenus of *Osmia* Panzer.

Heliophila KLUG (=Saropoda LATREILLE).

Magazin für Insektenkunde, vol. 6, p. 197, 1807.

Type.—*Apis bimaculata* PANZER, 1798. (Monobasic.)

Hemihalictus COCKERELL.

Can. Ent., vol. 29, p. 287, 1897.

Type.—*Panurgus lustrans* COCKERELL, 1897. (Monobasic.)

Heminomada COCKERELL (=Xanthidium ROBERTSON, 1903, not EHRENBURG, 1833).
Ann. Mag. Nat. Hist., ser. 7, vol. 10, p. 42, 1902.

Type.—*Nomada obliterata* CRESSON, 1863. (Monobasic and original designation.)

Proposed as a subgenus of *Nomada* Fabricius.

Hemisia KLUG (=Centris auct., not FABRICIUS).

Magazin für Insektenkunde, vol. 6, pp. 198 and 227, 1807. Four species.

Type.—(*Centris haemorrhoidalis* (FABRICIUS), 1804) = *Apis haemorrhoidalis* Fabricius, 1775. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 32, p. 105, 1906.)

Synonym of *Centris* Fabricius, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 252, 1896, but this is incorrect. *Hemisia* should be used for *Centris* auct., not Fabricius.

(Herbstiella FRIESE, not STIMPSON, 1871) = Kelita, new name.

Stettin. Ent. Zeit., vol. 77, p. 168, 1916.

Type.—*Herbstiella chilensis* FRIESE, 1916. (Monobasic.)

Heriades SPINOLA (=Trypetes SCHENK, 1859, not SCHÖNHERR, 1836; Eriades DALLA TORRE and FRIESE).

Insectorum Liguriae species novae aut rariores . . . , vol. 2, p. 7, 1808. Seven species.

Type.—(*Anthophora truncorum* FABRICIUS, 1804) = *Apis truncorum* LINNAEUS, 1758. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.) *Apis campanularum* Kirby, 1802, designated by Curtis, Brit. Ent., vol. 11, p. 504, 1834. *Heriades rapunculi* "Fabricius" [Lepeletier, 1841] designated by Blanchard, in Cuvier, Règne Animal, [ed. 3], insectes, text vol. 2, p. 208; atlas, pl. 126, fig. 7, [1849], was not originally included. *Apis florissomnis* Linnaeus, 1758, designated by Taschenberg, Berlin, Ent. Zeitschr., vol. 27, p. 1883.

Isogenotypic with *Trypetes* Schenck.

Heriadopsis COCKERELL.

Rev. Zool. Bot. Africae, vol. 20, p. 338, 1931.

Type.—*Heriadopsis striatulus* COCKERELL, 1931. (Monobasic and original designation.)

Hesperapis COCKERELL.

Can. Ent., vol. 30, p. 147, 1898.

Type.—*Hesperapis elegantula* COCKERELL, 1898. (Monobasic.)

Hesperonomada LINSLEY.

Pan-Pacific Ent., vol. 15, p. 5, 1939.

Type.—*Hesperonomada melanantha* LINSLEY, 1939. (Monobasic and original designation.)

Heteranthidium COCKERELL.

Ent. News, vol. 15, p. 292, 1904.

Type.—*Anthidium dorsale* LEPELETIER, 1841. (Monobasic and original designation.)

(Heterapis COCKERELL, not LINSTON, 1889) = Heterapoides, new name.

Entomologist, vol. 44, p. 140, 1911. Two species.

Type.—*Heterapis delicata* COCKERELL, 1911. (Original designation.)

Heterapoides, new name (=Heterapis COCKERELL, 1911, not LINSTON, 1889).

Type.—*Heterapis delicata* COCKERELL, 1911. (Autobasic.)

Heterocentris COCKERELL (=Gundlachia CRESSON, 1865, not PFELFFER, 1849; *Rhodocentris* Friese).

Entomologist, vol. 32, p. 14, 1899.

Type.—(*Centris* ? *cornuta* CRESSON, 1865, not FABRICIUS, 1787)=*Centris difformis* F. SMITH, 1854. (Autobasic.)

Proposed for *Gundlachia* Cresson, preoccupied.

Isogenotypic with *Rhodocentris* Friese.

Heterocolletes RAYMENT.

A cluster of bees, p. 184, 1935.

Type.—*Paracolletes* (*Heterocolletes*) *capillatus* RAYMENT, 1935. (Monobasic and original designation.)

Proposed as a subgenus of *Paracolletes* F. Smith.

Heterorhiza COCKERELL.

Mem. Queensland Mus., vol. 9, p. 316, 1929. Four species.

Type.—*Palaeorhiza melanura* COCKERELL, 1910. (Original designation.)

Proposed as a subgenus of *Palaeorhiza* Perkins.

Heterosarus ROBERTSON.

Ent. News, vol. 29, p. 91, 1918.

Type.—*Calliopsis parvus* ROBERTSON, 1892. (Monobasic and original designation.)

Heterotrigona SCHWARZ.

Bull. Amer. Mus. Nat. Hist., vol. 76, p. 96, 1939. Two species.

Type.—*Trigona itama* COCKERELL, 1919. (Original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Hexepeolus LINSLEY AND MICHENER.

Pan-Pacific Ent., vol. 13, pp. 77 and 81, 1937. Two species.

Type.—*Hexepeolus mojaviensis* LINSLEY AND MICHENER, 1937. (Original designation.)

Holandrena PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 44, p. 176, 1890. Eight species.

Type.—(*Melitta*) *Andrena labialis* (KIRBY), 1802. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 214, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

Holcopasites ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 82, 1899. No species.

Crawford, Insecutor Inscitiae Menstruus, vol. 3, p. 123, 1915. Seven species.

Type.—*Phileremus illinoiensis* ROBERTSON, 1891. (By designation of Crawford, Insecutor Inscitiae Menstruus, vol. 3, p. 123, 1915.)

Holmbergeria JÖRGENSEN.

Zool. Jahrb., Abt. Syst., Jena, vol. 32, p. 100, 1912.

Type.—*Holmbergeria cristariae* JÖRGENSEN, 1912. (Monobasic.)

(*Holmbergiapis* COCKERELL)=*Alloscirtetica* HOLMBERG.

Trans. Amer. Ent. Soc., vol. 44, p. 36, 1918.

Type.—*Scirtetica artarctica* HOLMBERG, 1903. (Autobasic.)

Proposed for *Scirtetica* Holmberg, preoccupied, but superseded by *Alloscirtetica* Holmberg.

Holonomada ROBERTSON.

Can. Ent., vol. 35, pp. 174, 175, and 177, 1903. Four species.

Type.—*Nomada superba* CRESSON, 1863. (Original designation.)

(*Homachthes* DALLA TORRE) for *Omachthes* GERSTAECKER.

Catalogus hymenopterorum, vol. 10, p. 499, 1896.

Homalictus COCKERELL.

Philippine Journ. Sci., vol. 15, p. 13, 1919. Four species.

Type.—*Halictus taclobanensis* COCKERELL, 1915. (Original designation.)

Proposed as a subgenus of *Halictus* Latreille.

Hoplandrena PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 44, p. 170, 1890. Many species.

Type.—(*Melitta*) *Andrena trimmerana* (KIRBY), 1802. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 214, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

Hopliophora LEPELETIER (= *Oxyredys* SCHROTTKY).

Histoire naturelle des Insectes, Hyménoptères, vol. 2, p. 458, 1841.

Type.—*Mesochaira velutina* LEPELETIER and SERVILLE, 1825. (Monobasic.)

Isogenotypic with *Oxyredys* Schrottky through synonymy.

(Hoplitella COCKERELL, not LEVENSON, 1909) = **Hoplitina** COCKERELL.

Can. Ent., vol. 42, p. 169, 1910.

Type.—*Hoplitella pentamera* COCKERELL, 1910. (Monobasic.)

Hoplitina COCKERELL (= *Hoplitella* COCKERELL, 1910, not LEVENSON, 1909.)

Can. Ent., vol. 45, p. 34, 1913.

Type.—*Hoplitella pentamera* COCKERELL, 1910. (Autobasic.)

Hoplitis KLUG (= *Ctenosmia* THOMSON).

Magazin für Insektenkunde, vol. 6, p. 225, 1807.

Type.—(*Anthophora adunca* FABRICIUS, 1804) = *Apis adunca* PANZER, 1798. (Monobasic.)

Isogenotypic with *Ctenosmia* Thomson.

Hoplonomia ASHMEAD.

Journ. New York Ent. Soc., vol. 12, p. 4, 1904. Three species.

Type.—*Hoplonomia quadrifasciata* ASHMEAD, 1904. (By designation of Cockerell, Proc. U. S. Nat. Mus., vol. 38, p. 289, 1910.)

Hoploparasites ASHMEAD.

Psyche, vol. 8, p. 284, 1898.

Type.—*Philcremus productus* CRESSON, 1879. (Monobasic and original designation.)

Hoploprosopis HEDICKE.

Deutsche Ent. Zeitschr., p. 415, 1926.

Type.—*Prosopis (Hoploprosopis) quadricornis* HEDICKE, 1926. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Hoplosmia THOMSON.

Hymenoptera Scandinaviae, vol. 2, p. 233, 1872. No species.

Schmiedeknecht, Apidae Europaeae, vol. 2, p. 23 [889], 1884–86 [1885]. Six species.

Type.—*Apis spinulosa* KIRBY, 1802. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 161, 1941.)

Proposed as a subgenus of *Osmia* Panzer.

Hortobombus VOGT.

Sitz.-Ber. Ges. naturf. Freunde Berlin, 1911, p. 56. Three species.

Type.—(*Apis*) *Bombus hortorum* (LINNAEUS), 1761. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Hylaeosoma ASHMEAD.

Psyche, vol. 8, p. 284, 1898.

Type.—*Hylaeosoma longiceps* ASHMEAD, 1898. (Monobasic and original designation.)

Hylaeus FABRICIUS (= *Pectinata* Popov; *Trichota* Popov; *Nylaeus* Popov). *Entomologia systematica*, vol. 2, pp. 194 and 302, 1793. Sixteen species.

Type.—(*Prosopis annulata* FABRICIUS, 1804) = *Apis annulata* LINNAEUS, 1758. (By designation of Latreille, *Considérations générales . . . des insectes*, p. 438, 1810.) (*Hylaeus signatus* Latreille = *Sphex signata* Panzer, 1798) = *Mellinus bipunctatus* Fabricius, 1798, designated by Blanchard, in Cuvier, *Règne Animal*, [ed. 3], *Insectes*, text vol. 2, p. 203; atlas, pl. 125, fig. 1, [1849], was not originally included.

Isogenotypic with *Trichota* Popov and *Pectinata* Popov. A proposal to suspend the rules and place *Prosopis* Jurine, 1807, on the Official List of Generic Names has been put before the International Commission, *Science*, vol. 83, p. 552, 1936. This would result in the replacement of *Hylaeus* Fabricius by *Prosopis* Fabricius.

Hyleoides F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 32, 1853. Two species.

Type.—*Vespa concinna* FABRICIUS, 1775. (By designation of Taschenberg, *Berlin. Ent. Zeitschr.*, vol. 27, p. 45, 1883.)

Hypanthidium COCKERELL.

Ent. News, vol. 15, p. 292, 1904. Four species.

Type.—*Anthidium flavomarginatum* F. SMITH, 1879. (Original designation.)

Hypochrotaenia HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 22, p. 273, 1886.

Type.—*Hypochrotaenia parvula* HOLMBERG, 1886. (Monobasic.)

Hypomacrotera COCKERELL AND PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 418, 1899. Two species.

Type.—*Hypomacrotera callops* COCKERELL AND PORTER, 1899. (Original designation.)

Hypotrigona COCKERELL.

Rev. Zool. Bot. Africales, vol. 26, pp. 47 and 54, 1934. Four species.

Type.—*Trigona gribodoi* MAGRETTI, 1884. (Original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Idioprosoxis MEADE-WALDO.

Ann. Mag. Nat. Hist., ser. 8, vol. 14, p. 451, 1914.

Type.—*Idioprosoxis chalcidiformis* MEADE-WALDO, 1914. (Monobasic and original designation.)

Synonym of *Chilicola* Spinola, according to Cockerell, *Ann. Mag. Nat. Hist.*, ser. 9, vol. 17, p. 218, 1926.

(*Imperfecta* Popov) = *Dentigera* Popov.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939. Four species.

Type.—(*Hylaeus*) *Prosopis brevicornis* NYLANDER, 1852. (Original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Isogenotypic with *Dentigera* Popov.

Imperfecta was first proposed by Méhely, *Naturgeschichte der Urbielen*, pp. 48 and 154, 1935, as a subgenus of *Prosopis* Fabricius to include five species but, under Article 25c, it has no validity from that date, since no genotype was designated.

Indohalictus BLÜTHGEN.

Zool. Jahrb., Abt. Syst., Jena, vol. 61, p. 291, 1931. Seven species.

Type.—*Halictus duccinus* VACHAL, 1894. (Original designation.)

Proposed as a subgenus of *Halictus* Latreille.

Iomeliassa ROBERTSON.

Trans. Acad. Sci. St. Louis, vol. 10, p. 50, 1900.

Type.—*Andrena violae* ROBERTSON, 1891. (Monobasic.)

Ischnocera SHUCKARD.

In Swainson and Shuckard: On the history and natural arrangement of insects (Lardner's The cabinet cyclopaedia. Natural history), p. 166, 1840. No species.

Isepeolus COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 20, p. 64, 1907.

Type.—*Isepeolus albopictus* COCKERELL, 1907. (Monobasic.)

Kallobombus DALLA TORRE (=Callobombus DALLA TORRE; Soroceansibombus VOGT.

Die Naturhistoriker, vol. 2, p. 40, 1880. Three species.

Type.—*Apis soroceansis* FABRICIUS, 1776. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Soroceansibombus* Vogt.

Kelita, new name (=Herbstiella FRIESE, 1916, not STIMPSON, 1871).

Type.—*Herbstiella chilensis* FRIESE, 1916. (Autobasic.)

(Kirbya LEPELETIER, not ROBINEAU-DESVOIDY, 1830) = Melitta KIRBY.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 145, 1841. Two species.

Type.—*Melitta tricineta* KIRBY, 1802. (Present designation.)

Isogenotypic with *Melitta* Kirby.

Kirbya Lepeletier is preoccupied and ordinarily would require a new name, but by this genotype designation becomes isogenotypic with *Melitta* Kirby.

(Koptobaster POPOV) for Koptogaster ALFKEN.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Koptogaster ALFKEN (=Koptobaster POPOV, 1939; Pseudobranchiata POPOV).

Ber. westpreuss. bot.-zool. Ver. Danzig, vol. 34, p. 23, 1912. Two species.

Type.—(*Prosopis*) *Hylaeus* (*Koptogaster*) *bifasciatus* (JUBINE), 1807. (By designation of Meade-Waldo, Genera Insectorum, fasc. 181, p. 16, 1923.)

Proposed as a subgenus of *Prosopis* Fabricius.

Isogenotypic with *Pseudobranchiata* Popov.

Koptortosoma GRIKODO (=Coptorthosoma PÉREZ, 1901.)

Bull. Soc. Ent. Italiana, vol. 26, p. 271, 1894. Two species.

Type.—*Koptortosoma gabonica* GRIKODO, 1894. (Present designation.)

Kozlovibombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 152, 1922. Two species.

Type.—(*Bombus*) *Kozlovibombus kozlovi* (SKORIKOV), 1909. (Present designation because of virtual tautonymy.)

Synonym of *Lapidariobombus* Vogt, according to Richards, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 641, 1930.

Laboriopsithyrus FRISON.

Trans. Amer. Ent. Soc., vol. 53, p. 69, 1927. Four species.

Type.—(*Bombus*) *Psithyrus laboriosus* (FABRICIUS), 1804. (Original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Laesobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 150, 1922.

Type.—(*Bombus*) *Agrobombus* (*Laesobombus*) *laesus* (MORAWITZ) 1875. (Monobasic.)

Proposed as a subgenus of *Agrobombus* Vogt.

Lagobata F. SMITH.

Journ. Ent., vol. 1, p. 151, 1861.

Type.—*Lagobata diligens* F. SMITH, 1861. (Monobasic.)

(*Lagripoda* VACHAL) for *Lagripode* LEPELETIER AND SERVILLE.

Ann. Soc. Ent. France, vol. 78, p. 7, 1909.

Lagripode LEPELETIER AND SERVILLE (= *Lagripoda* VACHAL).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 795, 1828. No species.

Lambdopsis MÉHELY.

Naturgeschichte der Urbienen, pp. 65 and 171, 1935. Four species.

Proposed as a subgenus of *Prosopis* Fabricius but invalid under Article 25c of the International Rules of Zoological Nomenclature, since no type was designated.

Lambdopsis POPOV.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 169, 1939.

Type.—(*Melitta*) *Prosopis annularis* (KIRBY), 1802. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Lambdopsis was first proposed by Méhely, Naturgeschichte der Urbienen, pp. 65 and 171, 1935, as a subgenus of *Prosopis* Fabricius to include four species but, under Article 25c, it has no validity from that date, since no genotype was designated.

Lamproapis CAMERON.

Journ. Bombay Nat. Hist. Soc., vol. 14, p. 419, 1902.

Type.—*Lamproapis maculipennis* CAMERON, 1902. (Monobasic.)

Synonym of *Nomada* Fabricius, according to Cockerell, Australian Zool., vol. 7, p. 38, 1931.

Lamprocolletes F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 10, 1853. Eleven species.

Type.—*Andrena chalybeata* ERICHSON, 1841. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 31, p. 345, 1905.)

Synonym of *Paracolletes* F. SMITH, according to Cockerell (loc. cit., p. 344).

Lanthanomalissa HOLMBERG (=Schrottkeya FRIESE).

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 418, 1903.

Type.—(*Lanthanomalissa discrepans* HOLMBERG, 1903) = *Tetrapedia goeldiana* FRIESE, 1899. (Monobasic.)

Isogenotypic with *Schrottkeya* Friese through synonymy.

Synonym of *Anthophorula* Cockerell, according to Schrottkey, Deutsche Ent. Zeitschr., p. 795, 1909.

(Lapidarlobombus VOGT) = Melanobombus DALLA TORRE.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 58, 1911. Eleven species.

Type.—(*Apis*) *Bombus lapidarius* (LINNAEUS), 1758. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Melanobombus* Dalla Torre.

Lasioglossum CURTIS.

Brit. Ent., vol. 10, p. 448, 1833.

Type.—(*Lasioglossum tricingulum* CURTIS, 1833) = *Melitta xanthopus* KIRBY, 1802. (Monobasic and original designation.)

Lasius JURINE.

Erlangen Litteratur-Zeitung, vol. 1, p. 164, 1801.

Type.—*Apis quadrimaculata* PANZER, 1798. (Monobasic.)

Invalidated by the suppression of the "Erlangen List" (Opinion 135).

Lasius PANZER.

Faunae insectorum Germaniae initia, Heft 86, No. 16, 1804.

Type.—*Lasius salviae* PANZER, 1804. (Monobasic.)

Synonym of *Podalirius* Latreille, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 288, 1896.

A proposal to place *Anthophora* Latreille, 1803, and *Lasius* Fabricius, 1804 (type *Formica nigra* Linnaeus), on the Official List of generic names is before the International Commission. Approval of this proposal would result in the replacement of *Lasius* Panzer, 1804, and *Podalirius* Latreille, 1802, by *Anthophora* Latreille.

Leiopodus F. SMITH (=Melectoides TASCHENBERG; Liopodus SCHULZ).

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 252, 1854.

Type.—*Leiopodus lacertinus* F. SMITH, 1854. (Monobasic.)

Isogenotypic with *Melectoides* Taschenberg through synonymy.

Leiproctus F. SMITH (=Lioproctus F. SMITH).

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 8, 1853.

Three species.

Type.—*Leiproctus imitatus* F. SMITH, 1853. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 31, p. 348, 1905.)

Lepidandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 215, 1933. Many species.

Type.—*Andrena curvungula* THOMPSON, 1870. (Original designation.) Proposed as a subgenus of *Andrena* Fabricius.

Lepidotrigona SCHWARZ.

Bull. Amer. Mus. Nat. Hist., vol. 76, p. 132, 1939. Three species.

Type.—*Trigona nitidiventris* F. SMITH, 1857. (Original designation.) Proposed as a subgenus of *Trigona* Jurine.

Leptergatis HOLMBERG.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 422, 1903. Three species.

Type.—*Leptergatis halictoides* HOLMBERG, 1903. (By designation of Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 592, 1920.)

(Leptoglossa FRIESE, not KLUG, 1839)=Orphana VACHAL.

Stettin. Ent. Zeit., vol. 86, p. 9, 1925.

Type.—(*Leptoglossa paradoxa* FRIESE, 1925)=*Orphana inquirenda* VACHAL, 1909. (Monobasic.)

Isogenotypic with *Orphana* Vachal through synonymy.

Leptoglossa Friese is preoccupied, but since it is a synonym of *Orphana* Vachal no replacement name is needed.

Leptometria HOLMBERG.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 409, 1903. Three species.

Type.—*Leptometria peregrae* HOLMBERG, 1903. (By designation of Brèthes, Bull. Soc. Ent. France, p. 213, 1910.)

Leptorachis MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 301, 308, and 311, 1934. Eleven species.

Type.—*Megachile petulans* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Lestis LEPELETIER AND SERVILE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, pp. 795 and 799, 1828.

Type.—(*Apis*) *Centris muscaria* (FABRICIUS), 1775. (Original designation.)

(*Apis*) *Centris bombylans* (FABRICIUS), 1775, designated by Taschenberg, Berlin. Ent. Zeitschr., vol. 27, p. 82, 1883.

Lestrimelitta FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 3, p. 361, 1903.

Type.—*Trigona limao* F. SMITH, 1863. (Monobasic.)

Proposed as a subgenus of *Trigona* Jurine.

Leucandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 216, 1933. Five species.

Type.—(*Apis*) *Andrena sericea* (CHRIST), 1791. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

(Leucobombus DALLA TORRE) = Bombus LATREILLE.

Naturhistoriker, vol. 2, p. 40, 1880. Six species.

Type.—(*Apis*) *Bombus terrestris* (LINNAEUS), 1758. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Bombus* Latreille and *Terrestribombus* Vogt.

Leucosmia ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 166 and 171, 1903.

Type.—*Osmia albiventris* CRESSON, 1864. (Monobasic and original designation.)

Synonym of *Nothosmia* ASHMEAD, according to Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 63, 1939.

Libellulapis COCKERELL [fossil].

Bull. Mus. Comp. Zool., vol. 50, p. 42, 1906.

Type.—*Libellulapis antiquorum* COCKERELL, 1906. (Monobasic.)

(Liogastra Perty) = Rhathymus LEPELETIER AND SERVILLE.

Delectus animalium articulatum . . . Brazilliam, p. 146, 1833.

Type.—(*Liogastra* *bicolor* PERTY, 1833) = *Rhathymus bicolor* LEPELETIER AND SERVILLE, 1828. (Monobasic.)

Isogenotypic with *Rhathymus* Lepeletier and Serville through synonymy.

(Leiopodus SCHULZ) for Leiopodus F. SMITH.

Spolia Hymenopterologica, p. 258, 1906.

Liopoeum FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 7, p. 175, 1906. Three species.

Type.—*Camptopoeum hirsutulum* SPINOLA, 1851. (Present designation.)

Proposed as a subgenus of *Camptopoeum* Spinola.

(Lioproctus F. SMITH) for Leioproctus F. SMITH.

Descriptions of new species of Hymenoptera in the collection of the British Museum, p. 6, 1879.

Liosmia THOMSON.

Hymenoptera Scandinaviae, vol. 2, p. 233, 1872. No species.

Friese, Das Tierreich, vol. 28, p. 438, 1911. Three species.

Type.—*Osmia claviventris* THOMSON, 1872. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 159, 1941.)

Proposed as a subgenus of *Osmia* Panzer.

(Liographis COCKERELL) for Liothyrapis COCKERELL.

Rev. Zool. Bot. Africae, vol. 23, p. 22, 1932.

Liothyrapis COCKERELL (=Paracoelioxys RADOSZKOWSKI, 1893, not GRIBODO, 1884; Liographis COCKERELL).

Proc. U. S. Nat. Mus., vol. 40, p. 246, 1911.

Type.—(*Coelioxys* *apicata* F. SMITH, 1854) = *Coelioxys decipiens* SPINOLA, 1838. (Monobasic.)

Proposed as a subgenus of *Coelioxys* Latreille.

Liphanthus REED.

Ann. Univ. Chile, vol. 85, p. 645, 1894.

Type.—*Liphanthus sabulosus* REED, 1894. (Monobasic.)

Genotype transferred to *Psaenythia* Gerstaecker by Friese, Die Apidae (Blumenwespen) von Argentina nach den Reiseresultaten der Herren A. C. Jensen-Haarup u. P. Jørgensen in den Jahren 1904–1907, p. 39, 1908.

Synonym of *Psaenythia* Gerstaecker, according to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 86, 1912.

Lipotriches GERSTAECKER.

Monatsb. Akad. Wiss. Berlin, 1857, p. 460, 1858.

Type.—*Lipotriches abdominalis* GERSTAECKER, 1857 (1858). (Monobasic.)

Lithandrena COCKERELL [fossil].

Bull. Mus. Comp. Zool. Harvard, vol. 50, p. 44, 1906.

Type.—*Lithandrena saworum* COCKERELL, 1906. (Monobasic.)

Lithanthidium COCKERELL [fossil].

Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 225, 1911.

Type.—*Lithanthidium pertriste* COCKERELL, 1911. (Monobasic.)

(Lithosinia ALFKEN) = Arctosmia SCHMIEDEKNECHT.

Ver. Deutsch. kolon-uebersee Mus. Bremen, vol. 1, p. 188, 1935. Ten species.

Type.—((*Megachile*) *Osmia villosa* (SCHENCK), 1853, not *Apis villosa* FABRICIUS, 1775) = *Osmia platycera* GERSTAECKER, 1869. (Present designation.)

Proposed as a subgenus of *Osmia* Panzer.

Isogenotypic with *Arctosmia* Schmiedeknecht.

Lithurge LATREILLE (=Lithurgus BERTHOLD).

Familles naturelles du règne animal . . . , p. 463, 1825.

Type.—(*Andrena*) *Centris cornuta* (FABRICIUS), 1787. (Monobasic.)

The amended spelling *Lithurgus* is usually employed.

Lithurgopsis FOX.

Ent. News, vol. 13, p. 138, 1902. Three species.

Type.—*Lithurgus apicalis* CRESSON, 1875. (Original designation.)

(Lithurgus BERTHOLD) for Lithurge LATREILLE.

Latreille's natürliche Familien des Thierreichs, p. 467, 1827.

Lithurgus is the spelling which is usually employed.

Litomegachile MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 301 and 308, 1934. Six species.

Type.—*Megachile brevis* SAY, 1837. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Lonchopria VACHAL.

Bull. Soc. Ent. France, p. 204, 1905.

Type.—(*Lonchopria herbsti* VACHAL, 1905) = *Colletes spinolae* Dalla Torre, 1896. (Monobasic.)

(Lucasiellus SCHULZ) = Lucasiellus COCKERELL.

Zool. Annal., vol. 4, p. 202, (1911) 1912.

Type.—*Halictus (Lucasius) clavipes* DOURS, 1872. (Autobasic.)

Proposed for *Lucasius* Dours, preoccupied but superseded by *Lucasiellus* Cockerell.

Lucasiellus COCKERELL (=Lucasius DOURS, 1872, not KINAHAN, 1859; Lucasellus SCHULZ).

Entomologist, vol. 38, p. 372, 1905.

Type.—*Halictus (Lucasius) clavipes* DOURS, 1872. (Autobasic.)

(*Lucasius* DOURS, not KINAHAN, 1859) = *Lucasiellus* COCKERELL.

Rev. et Mag. Zool., ser. 2, vol. 23, p. 350, 1872. Two species.

Type.—*Halictus (Lucasius) clavipes* DOURS, 1872. (Present designation.)

Proposed as a subgenus of *Halictus* Latreille.

(*Lutziella* COCKERELL, not ENDERLEIN, 1922) = *Cockerellula* STRAND.

Amer. Mus. Novitates, no. 47, p. 1, 1922.

Type.—*Perdita (Lutziella) opuntiae* COCKERELL, 1922. (Monobasic and original designation.)

Proposed as a subgenus of *Perdita* F. Smith.

Lysicolletes RAYMENT.

A cluster of bees, p. 208, 1935. Three species.

Type.—*Paracolletes (Lysicolletes) singularis* RAYMENT, 1935. (Original designation.)

Proposed as a subgenus of *Paracolletes* F. Smith.

Machaeris ROBERTSON.

Ent. News, vol. 14, p. 104, 1903. Two species.

Type.—*Sphecodes stygius* ROBERTSON, 1893. (Original designation.)

(*Macrocera* LATREILLE, not MEIGEN, 1803) = *Tetralonia* SPINOLA.

Considérations générales . . . des insectes, pp. 339 and 439, 1810.

Type.—(*Eucera antennata* PANZER, 1806 = *Eucera antennata* FABRICIUS, 1793) = *Apis malvae* ROSSI, 1790. (Monobasic and original designation.)

Macrocera ruficollis Lepeletier, 1841 [Brullé, 1832] designated by Blanchard in Cuvier, Règne Animal, [ed. 3], insectes, text vol. 2, p. 215; atlas pl. 128 bis, fig. 3a, [1849] was not originally included.

Macrogalea COCKERELL.

Rev. Zool. Bot. Africaines, vol. 18, p. 291, 1930. Two species.

Type.—*Allodape candida* F. SMITH, 1879. (Original designation.)

(*Macroglossa* RADOSZKOWSKI, not OCHSENHEIMER, 1816, not WESTWOOD, 1835, not LESSON, 1837, not GRAY, 1870) = *Macroglossapis* COCKERELL.

Horae Soc. Ent. Ross., vol. 18, p. 17, 1884.

Type.—(*Macroglossa oribazi* RADOSZKOWSKI, 1884) = (*Macrocera*) *Tetralonia analis* (LEPELETIER), 1841. (Monobasic.)

Genotype transferred to *Tetralonia* Spinola by Friese, Zeitschr. Syst. Hym. Dipt., vol. 4, p. 100, 1904.

Synonym of *Tetralonia* Spinola, according to Ducke, Zool. Jahrb., Abt., Syst., Jena, vol. 34, p. 96, 1912.

Macroglossapis COCKERELL (= *Macroglossa* RADOSZKOWSKI, 1884, not OCHSENHEIMER, 1816, not WESTWOOD, 1835, not LESSON, 1837, not GRAY, 1870).

Catálogo de las abejas de México, pp. 4 and 14, 1899.

Type.—(*Macroglossa oribazi* RADOSZKOWSKI, 1884) = (*Macrocera*) *Tetralonia analis* (LEPELETIER), 1841. (Monobasic.)

Synonym of *Tetralonia* Spinola, according to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 97, 1912.

Macronomia COCKERELL.

Ann. Durban Mus., vol. 1, p. 468, 1917.

Type.—*Nomia (Macronomia) platycephala* COCKERELL, 1917. (Monobasic and original designation.)

Proposed as a subgenus of *Nomia* Latreille.

(*Macropis* KLUG) = *Megilla* FABRICIUS.

In Panzer, Faunae insectorum Germaniae Initiae, Heft 107, no. 16, 1809.

Type.—(*Macropis labiata* KLUG, 1809) = *Megilla labiata* FABRICIUS, 1804. (Monobasic.)

Isogenotypic with *Megilla* Fabricius.

Richards, in *The generic names of British insects*, pt. 5, p. 90, 1937, has proposed that *Macroptis* Panzer be added to the Official List of Generic Names.

Macrotera F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 130, 1853.

Type.—*Macrotera bicolor* F. SMITH, 1853. (Monobasic.)

Macroteropsis ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 85, 1899.

Type.—*Perdita latior* COCKERELL, 1896. (Monobasic and original designation.)

(**Manuelia** VACHAL) = **Corynura** SPINOLA.

Bull. Soc. Ent. France, p. 25, 1905. Three species.

Type.—*Halictus (Corynura) gayi* SPINOLA, 1851. (Present designation.)

Isogenotypic with *Corynura* Spinola and *Corynogaster* Sichel.

Martinapis COCKERELL (= **Martinella** COCKERELL, 1903, not Jousseaume, 1887).

Entomologist, vol. 62, p. 19, 1929.

Type.—*Melissodes luteicornis* COCKERELL, 1896. (Autobasic.)

(**Martinella** COCKERELL, not JOUSSEAUME, 1887) = **Martinapis** COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 450, 1903.

Type.—*Melissodes luteicornis* COCKERELL, 1896. (Monobasic.)

Proposed as a subgenus of *Melissodes* Latreille.

Mastrucatorobombus KRUGER.

Ent. Mitt., vol. 6, p. 66, 1917.

Type.—*Bombus mastrucatus* GERSTAECKER, 1869. (Monobasic.)

Proposed as a subgenus of *Bombus* Latreille.

Synonym of *Alpigenobombus* Skorikov, according to Richards, Ann. Mag. Nat. Hist., ser. 10, vol. 5, p. 636, 1930.

Megabombus DALLA TORRE (= **Megalobombus** SCHULZ).

Naturhistoriker, vol. 2, p. 40, 1880.

Type.—(*Bombus ligusticus* SPINOLA, 1805) = *Apis argillacea* SCOPOLI, 1763. (Monobasic.)

Proposed as a subgenus of *Bombus* Latreille.

Megachile LATREILLE (= **Anthemois** ROBERTSON; **Megalochila** SCHULZ).

Histoire naturelle de fourmis, pp. 413 and 433, 1802. Thirteen species.

Type.—(*Apis*) *Megachile centuncularis* (LINNAEUS), 1758. (By designation of Curtis, Brit. Ent. vol. 5, pl. 218, 1828.) (*Xylcopa muraria* Fabricius, 1804) = *Apis muraria* Retzius, 1783, designated by Blanchard, Histoire naturelle des insects . . . , vol. 3, p. 408, 1840.

Isogenotypic with *Anthemois* Robertson through synonymy.

Megachiloides MITCHELL.

Journ. Elisha Mitchell Sci. Soc., vol. 40, p. 154, 1924.

Type.—*Megachiloides oenotherae* MITCHELL, 1924. (Monobasic.)

Megacilissa F. SMITH (= **Megalocilissa** SCHULZ).

Catalogue hymenopterous insects . . . British Museum, pt. 1, p. 123, 1853.

Type.—(*Megacilissa superba* F. SMITH, 1853) = *Caupolicana fulvicollis* SPINOLA, 1851. (Monobasic.)

Synonym of *Caupolicana* Spinola, according to Cockerell, Ent. News, vol. 11, p. 510, 1900, and Alfken, Ver. Deutsch. kolon-uebersee. Mus. Bremen, vol. 1, p. 317, 1936.

(**Megalobombus** SCHULZ) for **Megabombus** DALLA TORRE.

Spolia hymenopterologica, p. 267, 1906.

(*Megalochila* SCHULZ) for *Megachile* LATREILLE.

Spolia hymenopterologica, p. 64, 1906.

(*Megalocilissa* SCHULZ) for *Megacilissa* F. SMITH.

Spolia hymenopterologica, p. 243, 1906.

Megalopta F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 83, 1853.

Two species.

Type.—*Megalopta bituberculata* F. SMITH, 1853. (By designation of Meade-Waldo, *Ann. Mag. Nat. Hist.*, ser. 8, vol. 17, p. 451, 1916.)

Megaloptella SCHROTTKY.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 312, 1906.

Type.—(*Halictus*) *Megalopta* (*Megaloptella*) *ochrias* (VACHAL), 1904. (Monobasic and original designation.)

Proposed as a subgenus of *Megalopta* F. Smith.

Synonym of *Megalopta* F. Smith, according to Schrottky, *Rev. d'Ent.*, vol. 27 p. 31, 1908.

Megaloptidia COCKERELL.

Proc. Acad. Nat. Sci. Philadelphia, p. 373, 1900.

Type.—*Megalopta* (*Megaloptidia*) *contradicta* COCKERELL, 1900. (Monobasic.)

Proposed as a subgenus of *Megalopta* F. Smith.

Megalosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, p. 23 [889], 1884–86 [1885]. Two species.

Type.—*Osmia grandis* MORAWITZ, 1873. (Present designation.)

Proposed as a subgenus of *Osmia* Panzer.

Megandrena COCKERELL.

Pan-Pacific Ent., vol. 4, p. 42, 1927.

Type.—*Andrena* (*Megandrena*) *cneciliae* COCKERELL, 1927. (Monobasic.)

Proposed as a subgenus of *Andrena* Fabricius.

Meganomia COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 402, 1909.

Type.—*Nomia* (*Meganomia*) *binghami* COCKERELL, 1909. (Monobasic.)

Proposed as a subgenus of *Nomia* Latreille.

Megapis ASHMEAD.

Proc. Ent. Soc. Washington, vol. 6, p. 120, 1904. Two species.

Type.—*Apis dorsata* FABRICIUS, 1793. (Original designation.)

Meghylaesus COCKERELL.

Mem. Queensland Mus., vol. 9, p. 314, 1929. Two species.

Type.—(*Palaeorhiza*) *Hylaeus giganteus* (COCKERELL), 1926. (Original designation.)

Proposed as a subgenus of *Hylaeus* Fabricius.

Megilla FABRICIUS (= *Macropis* KLUG).

Systema piezatorum, p. 328, 1804. Many species.

Type.—*Megilla labiata* FABRICIUS, 1804. (By designation of Westwood, An introduction to the modern classification of insects, vol. 2, Synopsis of the genera of British insects, p. 158, 1840.) *Apis acervorum* Linnaeus, 1758, designated by Richards, *Trans. Roy. Ent. Soc. London*, vol. 83, p. 172, 1935.

Isogenotypic with *Macropis* Panzer.

Richards, *The generic names of British insects*, pt. 5, p. 91, 1937, has proposed that *Apis acervorum* Linnaeus be considered the type of *Megilla* and that Westwood's earlier designation be rejected. *Megilla* would then fall as a synonym of *Anthophora* Latreille, if that name is placed on the Official List of Generic Names, otherwise under *Podalirius* Latreille.

(*Mehelya* Popov, not CSIKI, 1903 = *Barbata* MÉHELY, 1935, not HUMPHREY, 1797, not SWAINSON, 1840) = *Mehelyana*, new name.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 167, 1939.

Type.—*Prosopis friesei* ALFKEN, 1904. (Autobasic.)

Mehelyana, new name (= *Mehelya* Popov, 1939, not CSIKI, 1903; *Barbata* MÉHELY, 1935, not HUMPHREY, 1797, not SWAINSON, 1840).

Type.—*Prosopis friesei* ALFKEN, 1904. (Autobasic.)

Melanapis CAMERON.

Journ. Bombay Nat. Hist. Soc., vol. 14, p. 420, 1902.

Type.—*Melanapis violaceipennis* CAMERON, 1902. (Monobasic.)

Melandrena PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 44, p. 170, 1890. Ten species.

Type.—*Andrena morio* BRULLÉ, 1832. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 216, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

Melanempis SAUSSURE.

In Granddider, Hist. Nat. Madagascar, vol. 20, Hymen., pt. 1, p. 84, 1890.

Type.—*Phileremus* (*Melanempis*) *ater* SAUSSURE, 1890. (Monobasic.)

Proposed as a subgenus of *Phileremus* Latreille.

Melanobombus DALLA TORRE (= *Lapidariobombus* Vogt).

Naturhistoriker, vol. 2, p. 40, 1880. Four species.

Type.—(*Apis*) *Bombus lapidarius* (LINNAEUS), 1758. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Lapidariobombus* Vogt.

Melanocentris FRIESE.

Ann. naturhist. Hofmus. Wien, vol. 15, pp. 241 and 244, 1900. Many species.

Type.—*Centris atra* FRIESE, 1900. (Present designation.)

Proposed as a subgenus of *Centris* Fabricius.

Melanomada COCKERELL.

Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 587, 1903.

Type.—*Nomada grindeliae* COCKERELL, 1903. (Monobasic and original designation.)

Melanosarus MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 303 and 307, 1934. Seven species.

Type.—*Megachile aylocopoides* F. SMITH, 1853. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Melanosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, pp. 19 [885] and 76 [942], 1884–86 [1885]. Seven species.

Type.—*Osmia fuciformis* LATREILLE, 1811. (By designation of Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 33, 1939.)

Proposed as a subgenus of *Osmia* Panzer.

Melanostelis ASHMEAD.

Psyche, vol. 8, p. 283, 1898.

Type.—(*Melanostelis* *betheli* ASHMEAD, 1898) = (*Stelis*) *Chelynia rubi* (COCKERELL), 1898. (Monobasic and original designation.)

Melea, new name (= *Anthomoessa* ROBERTSON, 1905, not AGASSIZ, 1846).

Type.—*Anthophora abrupta* Say, 1837. (Autobasic.)

Melecta LATREILLE (=Symmorpha KLUG).

Histoire naturelle de fourmis . . . , p. 427, 1802. Three species.

Type.—(*Apis*) *Centris punctata* (FABRICIUS), 1775. (By designation of Latreille, *Considérations générales . . . des insectes*, p. 439, 1810.)
Nomada histrio Fabricius, 1775, considered type by Malaise, *Ent. News*, vol. 48, p. 132, 1937, who contended that Fabricius had designated it type by the manner of description.

Isogenotypic with *Symmorpha*.

(Melectoides TASCHENBERG)=Leiopodus F. SMITH.

Berlin. Ent. Zeitschr., vol. 27, p. 75, 1883.

Type.—(*Melectoides senex* TASCHENBERG, 1883)=*Leiopodus lacertinus* F. SMITH, 1854. (Monobasic and original designation.)

Isogenotypic with *Leiopodus* F. Smith through synonymy.

Melectomimus LINSLEY.

Ann. Ent. Soc. Amer., vol. 32, p. 448, 1939.

Type.—*Melecta edwardsii* CRESSON, 1878. (Monobasic and original designation.)

Proposed as a subgenus of *Melecta* Latreille.

Melectomorpha LINSLEY.

Ann. Ent. Soc. Amer., vol. 32, p. 451, 1939. Four species.

Type.—*Melecta californica* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Melecta* Latreille.

(Meliphila SCHROTTKY)=Melitoma LEPELETIER and SERVILLE.

Anal. Mus. Nac. Buenos Aires, vol. 7 (ser. 2, vol. 4), p. 310, 1902.

Type.—(*Meliphila ipomocae* SCHROTTKY, 1902)=*Melitoma euglossoides* LEPELETIER AND SERVILLE, 1828. (Monobasic and original designation.)

Isogenotypic with *Melitoma* Lepeletier and Serville through synonymy.

Melipona ILLIGER.

Magazin für Insektenkunde, vol. 5, p. 157, 1805 [1806]. Two species.

Type.—*Apis favosa* FABRICIUS, 1798. (By designation of Latreille, *Considérations générales . . . des insectes*, p. 439, 1810.) *Melipona fulva* Lepeletier, 1841, designated by Blanchard, in Cuvier, *Règne Animal* [ed. 3], insectes, text vol. 2, p. 227; atlas pl. 129, fig. 7, [1849], was not originally included.

Meliponorytes TOSI [fossil].

Riv. Ital. Palaeont., vol. 2, p. 352, 1896. Two species.

Type.—*Meliponorytes succini* TOSI, 1896. (Present designation.)

Meliponula COCKERELL.

Rev. Zool. Bot. Africales, vol. 26, pp. 47 and 56, 1934. Nine species.

Type.—*Melipona bocandei* SPINOLA, 1851. (Original designation.)

Proposed as a subgenus of *Melipona* Illiger.

(Melissa F. SMITH)=Mesoplia LEPELETIER.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 279, 1854. Four species.

Type.—*Mesocheira azurea* LEPELETIER AND SERVILLE, 1825. (Present designation.)

Isogenotypic with *Mesoplia* Lepeletier.

Melissina COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 8, p. 670, 1911.

Type.—*Melissina viator* COCKERELL, 1911. (Monobasic.)

(**Melissoda** LEPELETIER) = **Ctenioschelus** ROMAND.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 508, 1841.

Type.—(*Melissoda latreillei* LEPELETIER, 1841) = (*Acanthopus*) *Ctenioschelus goryi* (ROMAND), 1840. (Monobasic.)

Isogenotypic with *Ctenioschelus* Romand through synonymy.

Melissode LATREILLE, nomen nudum.

Familles naturelles du règne animal . . . , p. 464, 1825.

(**Melissodes** BERTHOLD, nomen nudum) for **Melissode** LATREILLE.

Latreille's natürliche Familien des Thierreichs, p. 468, 1827.

Melissodes LATREILLE.

In Cuvier, Règne Animal, ed. 2, vol. 5, p. 354, 1829. No species.

Romand, in Guérin, Mag. Zool., ser. 2, ann. 3, p. 5, pl. 70, 1841. One species.

Type.—*Melissodes fonscolombi* ROMAND, 1841. (First included species.)

Apis (*Melissodes*) *lepricuri* Blanchard designated by Blanchard (in Cuvier, Règne Animal, [ed. 3], insectes, text vol. 2, p. 216; atlas pl. 128 bis, fig. 4, [1849]).

Melissoptila HOLMBERG.

Actas Acad. Nac. Cienc. Córdoba, vol. 5, p. 119, 1884.

Type.—*Melissoptila tandilensis* HOLMBERG, 1884. (Monobasic.)

Synonym of *Tetralonia* Spinola, according to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 97, 1912.

(**Melittoma** BERTHOLD, nomen nudum) for **Melittome** LATREILLE.

Latreille's natürliche Familien des Thierreichs, p. 468, 1827.

Melittoma LEPELETIER AND SERVILE (= **Meliphila** SCHROTTKY).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 529, 1828.

Type.—*Melittoma euglossoides* LEPELETIER AND SERVILE, 1828. (Monobasic.)

Isogenotypic with *Meliphila* Schrottky through synonymy.

Melittome LATREILLE, nomen nudum.

Familles naturelles du règne animal . . . , p. 464, 1825.

Melitribus RAYMENT.

Proc. Roy. Soc. Victoria, new ser., vol. 42, p. 217, 1930. Two species.

Type.—*Melitribus greavesi* RAYMENT, 1930. (Original designation.) (*Gastropsis*) *Melitribus victoriae* (COCKERELL), 1906, designated by Rayment, Proc. Roy. Soc. Victoria, new ser., vol. 43, p. 61, 1930.

The genotypes of both *Stenotritus* F. Smith and *Gastropsis* F. Smith were included in *Melitribus* by Rayment, Victorian Nat. vol. 47, p. 11, 1930.

A subgenus of *Stenotritus* F. Smith according to Cockerell, Austr. Zool., vol. 8, pt. 1, p. 6.

Melitta KIRBY (= **Kirbya** LEPELETIER, 1841, not ROBINEAU-DESVOIDY, 1830).

Monographia apum Angliæ, vol. 1, pp. 117, 130, and 114, and vol. 2, p. 4, 1802.

Many species.

Type.—*Melitta tricineta* KIRBY, 1802. (By designation of Richards, Trans. Ent. Soc. London, vol. 83, p. 172, 1935.) This species was described by Kirby in vol. 2, p. 171, but the two volumes apparently appeared simultaneously.

Isogenotypic with *Kirbya* Lepeletier.

(**Melittidia** DALLA TORRE) for **Melittidia** GUÉRIN.

Catalogus hymenopterorum, vol. 10, p. 99, 1896.

Melittoides FRIESE.

Arch. Naturg., Jahrg. 87, Abt. A, pp. 161 to 174, and 177 to 180, 1921. Seven species.

Type.—*Andrena melittoides* FRIESE, 1899. (By absolute tautonymy.)

Melittosmithia SCHULZ (=Smithia VACHAL, 1897, not MILNE-EDWARDS, 1851, not SAUSSURE, 1855, not MABILLE, 1880, not MALTZAN, 1883, not MONTEBOATO, 1884).

Spolia hymenopterologica, p. 244, 1903.

Type.—*Scrapler carinata* F. SMITH, 1862. (Autobasic.)

Melittoxena MORAWITZ.

Horae Soc. Ent. Ross., vol. 9, p. 154, 1872 (1873).

Type.—*Nomada truncata* NYLANDER, 1848. (Monobasic.)

Synonym of *Biastes* Panzer, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 501, 1896.

Melitturga LATREILLE (=Melitturga LEPELETIER AND SERVILLE).

Genera crustaceorum et insectorum . . . , vol. 4, p. 176, 1809.

Type.—*Eucera clavicornis* LATREILLE, 1806. (Monobasic.)

(**Melitturga** LEPELETIER AND SERVILLE) for **Melitturga** LATREILLE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 799, 1828.

Melitturgopsis ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 62, 1899. No species.

Cockerell and Cockerell, Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 49, 1901.
No species.

Cockerell, Psyche, vol. 10, p. 77, 1903. No species.

Cockerell, Proc. U. S. Nat. Mus., vol. 26, p. 414, 1909 (May). One species.

Type.—*Emphoropsis murihirta* subsp. *murina* COCKERELL, 1909. (First included form.) *Anthophora aurenticaudata* Dours, 1869, designated by Vachal, Ann. Soc. Ent. France, vol. 78, p. 9, 1909 (July).

Synonym of *Emphoropsis* Ashmead, according to Cockerell, 1901, 1903, and 1909.

Melitturgula FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 3, p. 33, 1903.

Type.—*Melitturgula braunsi* FRIESE, 1903. (Monobasic.)

Mellitidia GUÉRIN (=Mellitidia DALLA TORRE).

In Duperrey's Voyage autour du Monde, exécuté . . . sur la Corvette La Coquille . . . , vol. 2, Zool., pt. 2, p. 270, (1830) 1838.

Type.—*Andrena australis* GUÉRIN, 1830. (Monobasic.)

Mendacibombus SKORIKOV.

Rev. Russe Ent., vol. 14, p. 125, 1914. Nine species.

Type.—*Bombus mcclurei* GERSTAECKER, 1869. (Present designation because of virtual tautonymy.)

Mermiglossa FRIESE.

Arch. Naturg., Jahrg. 78, Abt. A, Heft 5, p. 188, 1912.

Type.—*Mermiglossa rufa* FRIESE, 1912. (Monobasic.)

Meroglossa F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 33, 1853.

Type.—*Meroglossa canaliculata* F. SMITH, 1853. (Monobasic.)

Meroglossula PERKINS.

Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 99, 1912.

Type.—*Meroglossa eucalypti* COCKERELL, 1910. (Monobasic.)

Proposed as a subgenus of *Meroglossa* F. Smith.

Mesochaira LEPELETIER AND SERVILLE (=Mesochira SCHULZ).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 106, 1825. Three species.

Type.—(*Mesochaira bicolor* LEPELETIER)=*Melecta bicolor* FABRICIUS, 1804.

(By designation of Taschenberg, Berlin. Ent. Zeitschr., vol. 27, p. 72, 1883.)

(**Mesochira** SCHULZ) for **Mesochaira** LEPELETIER AND SERVILLE.

Spolia hymenopterologica, p. 257, 1903.

Mesonychium LEPELETIER AND SERVILLE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 107, 1825.

Type.—*Mesonychium coerulescens* LEPELETIER AND SERVILLE, 1825. (Monobasic.)

Mesoplia LEPELETIER (=Melissa F. SMITH).

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 457, 1841.

Type.—*Mesochra azurea* LEPELETIER AND SERVILLE, 1825. (Monobasic.)

Isogenotypic with *Melissa* F. SMITH.

Mesotrichia WESTWOOD.

Trans. Ent. Soc. London, vol. 2, p. 112, 1838.

Type.—*Mesotrichia torrida* WESTWOOD, 1838. (Monobasic.)

Metapsithyrus POPOV.

Eos, vol. 7, p. 135, 1931. Five species.

Type.—(*Apis*) *Psithyrus campestris* (PANZER), 1801. (Original designation.)

Proposed as a subgenus of *Psithyrus* Lepeletier.

Metylaeus BRIDWELL.

Proc. Hawaiian Ent. Soc., vol. 4, pp. 126 and 131, 1919. Three species.

Type.—*Metylaeus cribratus* BRIDWELL, 1919. (Original designation.)

Micralictoides TIMBERLAKE.

Ann. Ent. Soc. Amer., vol. 32, p. 397, 1939. Two species.

Type.—*Halictoides ruficauda* MICHENER, 1937. (Original designation.)

Proposed as a subgenus of *Dufourea* Lepeletier.

Micrandrena ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 89, 1899.

Type.—(*Micrandrena pacifica* ASHMEAD, 1899)=*Andrena* (*Micrandrena*) *melanochroa* COCKERELL, 1898. (Monobasic and original designation.)

Micranthidium COCKERELL.

Rev. Zool. Bot. Africaines, vol. 19, pp. 45 and 48, 1930. Seven species.

Type.—(*Anthidium*) *Pachyanthidium* (*Micranthidium*) *truncatum* (F. SMITH), 1854. (Original designation.)

Proposed as a subgenus of *Pachyanthidium* Friese.

Micranthophora COCKERELL.

Trans. Amer. Ent. Soc., vol. 32, p. 66, 1906. Eleven species.

Type.—*Anthophora* (*Micranthophora*) *curta* PROVANCHER, 1895. (Original designation.)

Proposed as a subgenus of *Anthophora* Latreille.

Micrapis ASHMEAD.

Proc. Ent. Soc. Washington, vol. 6, p. 122, 1904.

Type.—*Apis florea* FABRICIUS, 1787. (Monobasic and original designation.)

Micraugochlora SCHROTTKY.

Deutsche Ent. Zeitschr., p. 483, 1909. No species.

Rev. Mus. La Plata, vol. 16 (ser. 2, vol. 3), p. 138, 1909. One species.

Type.—*Micraugochlora sphacrocephala* SCHROTTKY, 1909. (First included species.)

Microdontura COCKERELL.

Mem. Queensland Mus., vol. 9, p. 322, 1929.

Type.—*Microdontura mellea* COCKERELL, 1929. (Monobasic.)

(*Micromelecta* BAKER)=*Zacoscma* ASHMEAD.

Invertebrata Pacifica, vol. 1, p. 143, 1906.

Type.—*Melecta maculata* CRESSON, 1879. (Monobasic and original designation.)

Isogenotypic with *Zacoscma* Ashmead.

Micronomada COCKERELL AND ATKINS.

Ann. Mag. Nat. Hist., ser. 7, vol. 10, p. 44, 1902.

Type.—*Nomada modesta* CRESSON, 1863. (Monobasic and original designation.)

Proposed as a subgenus of *Nomada* Fabricius.

Microstelis ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 170 and 175, 1903. Two species.

Type.—*Stelis lateralis* CRESSON, 1864. (Original designation.)

Mimulapis BRIDWELL.

Proc. Hawaiian Ent. Soc., vol. 4, p. 162, 1919.

Type.—*Mimulapis versatilis* BRIDWELL, 1919. (Monobasic and original designation.)

(Monia WESTWOOD, not GRAY, 1850) = **Monidia** COCKERELL.

Trans. Ent. Soc. London, p. 221, 1875.

Type.—*Monia grisea* WESTWOOD, 1875. (Monobasic.)

Monidia COCKERELL (= **Monia** WESTWOOD, 1875, not GRAY, 1850):

Ent. News, vol. 16, p. 9, 1905.

Type.—*Monia grisea* WESTWOOD, 1875. (Autobasic.)

Monilapis COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 7, p. 529, 1931.

Type.—(*Hylaeus*) *Halictus tomentosus* (EVERSMANN), 1852. (Monobasic and original designation.)

Proposed as a subgenus of *Halictus* Latreille.

Monilosmia ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 166 and 171, 1903.

Type.—(*Osmia canadensis* CRESSON, 1864) = *Osmia (Nothosmia) simillima* F. SMITH, 1853. (Monobasic and original designation.)

Synonym of *Nothosmia* Ashmead, according to Sandhouse, Mem. Ent. Soc.

Washington, No. 1, p. 63, 1939.

Monoecca LEPELETIER AND SERVILE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 528, 1828.

Type.—*Monoecca brasiliensis* LEPELETIER AND SERVILE, 1828. (Monobasic.)

Monumetha CRESSON.

Proc. Ent. Soc. Philadelphia, vol. 2, p. 387, 1864. Three species.

Type.—(*Monumetha argentifrons* CRESSON, 1864) = (*Chelostoma*) *Monumetha albifrons* (KIRBY), 1837. (By designation of Titus, Journ. New York Ent. Soc., vol. 12, p. 26, 1904.)

Morawitzia FRIESE.

Zeltschr. Syst. Hym. Dipt., vol. 2, p. 185, 1902.

Type.—*Morawitzia panurgoides* FRIESE, 1902. (Monobasic.)

Morgania F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 253, 1854.

Type.—(*Pasites dichroa* F. SMITH, 1854, not *Ammobates dichroa* SPINOLA, 1843) = *Morgania gerstäckeri* SCHULZ, 1906. (Monobasic.)

Mucidobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 149, 1922. Two species.

Type.—(*Bombus*) *Mucidobombus mucidus* (GERSTAECKER), 1869. (Present designation because of virtual tautonymy.)

Mydrosoma F. SMITH.

Descriptions of new species of Hymenoptera . . . British Museum, p. 5, 1879.

Type.—*Mydrosoma metallicum* F. SMITH, 1879. (Monobasic.)

Nannotrigona COCKERELL.

Proc. U. S. Nat. Mus., vol. 60, art. 2413, p. 9, 1922.

Type.—*Melipona testaceicornis* LEPELETIER, 1836. (Monobasic and original designation.)

Navicularia MÉHELY.

Naturgeschichte der Urbienen, pp. 34 and 140, 1935. Ten species.

Proposed as a subgenus of *Prosopis* Fabricius but invalid under Article 25c of the International Rules of Zoological Nomenclature, since no genotype was designated.

Navicularia POPOV.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Type.—(*Mellinus*) *Prosopis variegata* (FABRICIUS), 1798. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Navicularia was first proposed by Méhely, Naturgeschichte der Urbienen, pp. 34 and 140, 1935, as a subgenus of *Prosopis* Fabricius to include ten species, but under Article 25c it has no validity from that date since no genotype was designated.

Nectarodiaeta HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887. Nomen nudum.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 420, 1903. One species.

Type.—*Nectarodiaeta oliveirae* HOLMBERG, 1903. (Monobasic.)

Neoceratina PERKINS.

Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 117, 1912.

Type.—*Neoceratina australensis* PERKINS, 1912. (Monobasic.)

Neochelynia SCHROTTKY.

Rev. Mus. Paulista, vol. 12, p. 187, 1920.

Type.—*Neochelynia paulista* SCHROTTKY, 1920. (Monobasic and original designation.)

Neocorynura SCHROTTKY (=Cacosoma F. SMITH, 1879, not FELDER, 1874).

Deutsche Ent. Zeitschr., p. 540, 1910.

Type.—*Cacosoma discolor* F. SMITH, 1879. (Autobasic.)

Synonym of *Rhopalictus* Sichel, according to Alfken, Deutsche Ent. Zeitschr., p. 147, 1926.

Neohalictoides VIERECK.

Ent. News, vol. 15, p. 261, 1904.

Type.—(*Panurgus*) *Halictoides maurus* (CRESSON), 1878. (Monobasic and original designation.)

Neolarra ASHMEAD.

Bull. Colorado Biol. Assoc., No. 1, p. 8, 1890.

Type.—*Neolarra pruinosa* ASHMEAD, 1890. (Monobasic.)

Neomegachile MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 302 and 307, 1934. Six species.

Type.—*Megachile chichimeca* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Neopasiphae PERKINS.

Ann. Mag. Nat. Hist., ser. 8, vol. 9, p. 114, 1912.

Type.—*Neopasiphae mirabilis* PERKINS, 1912. (Monobasic.)

Neopasites ASHMEAD (= **Gnathopasites** LINSLEY AND MICHENER).

Psyche, vol. 8, p. 284, 1898.

Type.—*Phileremus fulviventris* CRESSON, 1878. (Monobasic and original designation.) Linsley and Michener, *Trans. Amer. Ent. Soc.*, vol. 65, p. 277, 1939, designated (*Phileremus fulviventris* Ashmead, 1898, not Cresson, 1878) = *Neopasites eamia* Cockerell, 1909, as the genotype, proposing the acceptance of a specimen rather than the species named by Ashmead as the basis of type fixation in this case. However, approval by the International Commission is necessary before that designation can be accepted (Opinion 65).

Isogenotypic with *Gnathopasites* Linsley and Michener.

Neoperdita ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 85, 1899.

Type.—*Perdita zebra* CRESSON, 1878. (Monobasic and original designation.)

(Neoscirtetica SCHROTTKY) = **Alloscirtetica** HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 75, p. 256, 1913.

Type.—*Scirtetica antarctica* HOLMBERG, 1903. (Autobasic.)

Proposed for *Scirtetica* Holmberg, preoccupied, but superseded by *Alloscirtetica* Holmberg.

Neotrypates ROBERTSON.

Ent. News, vol. 29, p. 92, 1918.

Type.—(*Trypates productus* ROBERTSON, 1905) = (*Megachile*) *Heriades (Neotrypates) variolosa* (CRESSON), 1872. (Monobasic and original designation.)

(Neshylaeus HEIDER) for **Nesylaeus** BRIDWELL.

Preussische Akad. Wiss. Berlin: Nomenclator animalium generum et subgenerum, vol. 3, Lief. 16, p. 2245, 1932.

Nesoeupetersia BLÜTHGEN.

Deutsche Ent. Zeitschr., Jahrg. 1935, p. 182, 1938. Four species.

Type.—(*Sphécodes*) *Eupetersia scotti* (COCKERELL), 1912. (Original designation.)

Proposed as a subgenus of *Eupetersia* Blüthgen.

Nesohalictus CRAWFORD.

Proc. U. S. Nat. Mus., vol. 38, p. 120, 1910.

Type.—*Halictus (Nesohalictus) robbii* CRAWFORD, 1910. (Monobasic and original designation.) The genotype is a synonym of (*Andrena*) *Halictus halictoides* (F. SMITH), 1869, according to Blüthgen, *Mitt. Deutsch. Ent. Ges.*, vol. 1, p. 75, 1930.

Proposed as a subgenus of *Halictus* Latreille.

Nesoprosopis PERKINS.

Fauna Hawaiianis, vol. 1, p. 75, 1899. Many species.

Type.—*Prosopis facilis* F. SMITH, 1879. (By designation of Popov, *Compt. Rend. (Doklady) Acad. Sci. U. R. S. S.*, new ser., vol. 25, p. 168, 1939.)

Nesothrincostoma BLÜTHGEN.

Mitt. Zool. Mus. Berlin, vol. 18, p. 364, 1933.

Type.—*Thrincostoma (Nesothrincostoma) serricorne* BLÜTHGEN, 1933. (Monobasic.)

Proposed as a subgenus of *Thrinchostoma* Saussure.

Nesylaeus BRIDWELL (= **Neshylaeus** HEIDER).

Proc. Hawaiian Ent. Soc., vol. 4, p. 147, 1919. Two species.

Type.—*Hylaeus (Nesylaeus) nesoprosopoides* BRIDWELL, 1919. (Original designation.)

• Proposed as a subgenus of *Hylaeus* Fabricius.

Nevadensibombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 149, 1922. Two species.

Type.—(*Bombus*) *Bremus nevadensis* (CRESSON), 1874. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 64, 1927.)

Synonym of *Bombias* Robertson, according to Frison, Trans. Amer. Ent. Soc., vol. 55, p. 117, 1929. *Bombus auricomus* Robertson, the genotype of *Bombias*, was originally included.

(Nitocris RAFINESQUE)=*Nomia* LATREILLE.

Analyse de la nature . . ., p. 123, 1815.

Type.—*Andrena curvipes* FABRICIUS, 1781. (Autobasic.)

Proposed unnecessarily for *Nomia* Latreille.

Nobilibombus SKORIKOV.

Mushi, vol. 6, p. 62, 1933. Three species.

Nodocolletes RAYMENT.

Journ. Roy. Soc. West Australia, vol. 17, p. 164, 1931. Five species.

Type.—*Nodocolletes dentatus* RAYMENT, 1931. (Original designation.)

Invalid under Article 25c (amendment) of the International Rules of Zoological Nomenclature, since no genotype was designated.

Nodula MA.

Rec. Indian Mus., vol. 40, pp. 270 and 290, 1938. Nine species.

Type.—*Apis amethystina* FABRICIUS, 1793. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

Nomada SCOPOLI.

Historico naturalis, annus 4, p. 44, 1770. Eight species.

Type.—(*Apis*) *Nomada ruficornis* (LINNAEUS), 1758. (By designation of Curtis, Brit. Ent., vol. 9, pl. 419, 1832.) (*Apis*) *Nomada fabriciana* (Linnaeus), 1767, designated by Latreille, *Considérations générales . . . des insectes*, p. 439, 1810, was not originally included. *Nomada succincta* Fabricius [? Panzer, 1798] designated by Blanchard, in Cuvier, *Règne Animal*, [ed. 3], *insectes*, text vol. 2, p. 213; atlas pl. 128, fig. 3 [1849], was not originally included. This procedure of assuming that *Nomada ruficornis* Scopoli, 1770, was the same as *ruficornis* Linnaeus, which was followed by Swenk, *Univ. Studies, Lincoln, Nebr.*, vol. 12, p. 6, 1912, and by Richards, *Generic names of British insects*, pt. 5, p. 138, 1937, seems the best way to retain *Nomada* in its usual interpretation. The other species which were originally included in *Nomada* are unrecognized and Scopoli's collection has been destroyed.

Nomadita MOCSARY.

Term. Fuz., vol. 17, p. 37, 1894.

Type.—*Nomadita montana* MOCSARY, 1894. (Monobasic.)

Nomadopsis ASHMEAD.

Psyche, vol. 8, p. 285, 1898.

Type.—*Perdita zonalis* CRESSON, 1879. (Monobasic and original designation.)

Nomadosoma ROHWER.

Ent. News, vol. 22, p. 24, 1911.

Type.—*Pasites pilipes* CRESSON, 1865. (Monobasic and original designation.)

Synonym of *Hypochrotaenia* Holmberg, according to Cockerell, *Ent. News*, vol. 27, p. 208, 1916.

Nomadula COCKERELL.

Proc. Acad. Nat. Sci. Philadelphia, vol. 55, p. 611, 1903. Six species.

Type.—("*Nomada americana* Kirby of Robertson")=*Nomada articulata* F. SMITH, 1854. (Original designation.)

Proposed as a subgenus of *Nomada* Fabricius.

Nomia LATREILLE (=Nitocris RAFINESQUE; Paranomia FRIESE, not Conrad, 1860).

Nouv. Dict. Hist. Nat., vol. 24, p. 182, 1804.

Type.—*Andrena curvipes* FABRICIUS, 1781. (Monobasic.) *Nomia diversipes* "Fabricius" [Latreille, 1806], designated by Blanchard, in Cuvier, Règne Animal [ed. 3], insectes, text vol. 2, p. 204; atlas pl. 125, fig. 7, [1849], was not originally included.

Nomiapis COCKERELL.

Proc. U. S. Nat. Mus., vol. 55, p. 208, 1919.

Type.—*Nomia diversipes* LATREILLE, 1806. (Monobasic and original designation.)

Proposed as a subgenus of *Nomia* Latreille.

Nomiocolletes BRÈTHES.

Anal. Mus. Nac. Buenos Aires, vol. 17 (ser. 3, vol. 10), p. 455, 1909. Two species.

Type.—*Nomia jörgenseni* FRIESE, 1908. (Original designation.)

Synonym of *Lonchopria* Vachal, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 247, 1909; and Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 79, 1912.

Nomioides SCHENCK.

Berlin. Ent. Zeitschr., vol. 10, p. 333, 1866.

Type.—(*Andrena pulchella* JURINE, 1807=(*Apis*) *Megilla parvula* (FABRICIUS), 1798)=(*Apis*) *Nomioides minutissima* (ROSSI), 1790. (Monobasic.)

Notandrena PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 10, p. 173, 1890. Ten species.

Type.—*Andrena nitidiuscula* SCHENCK, 1853. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 216, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

Notanthidium ISENSEE.

Ann. Carnegie Mus., vol. 17, p. 371, 1927.

Type.—(*Anthidium steloides* GAY)=*Anthidium steloides* SPINOLA, 1851. (Monobasic and original designation.)

Proposed as a subgenus of *Dianthidium* Cockerell.

Noteriades COCKERELL.

Rev. Zool. Bot. Africanes, vol. 20, p. 332, 1931. Five species.

Type.—(*Megachile*) *Heriades tricarinatus* (BINGHAM), 1903. (Original designation.)

Proposed as a subgenus of *Heriades* Spinola.

Nothosmia ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 75, 1899.

Type.—*Osmia distincta* CRESSON, 1864. (Monobasic and original designation.)

Nothylaeus BRIDWELL.

Proc. Hawaiian Ent. Soc., vol. 4, p. 125, 1919. Eleven species.

Type.—*Prosopis heraldica* F. SMITH, 1853. (Original designation.)

Notocolletes COCKERELL.

Ann. Mag. Nat. Hist., ser. 8, vol. 18, p. 44, 1916.

Type.—*Notocolletes heterodoxus* COCKERELL, 1916. (Monobasic.)

Notomelitta COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 12, p. 128, 1933.

Type.—*Rediviva neliana* COCKERELL, 1931. (Monobasic and original designation.)

Nyctomelitta COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 303, 1929. Two species.

Type.—(*Bombus*) *Xylocopa* (*Nyctomelitta*) *tranquebarica* (FABRICIUS), 1804. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

(*Nylaeus* POPOV) for *Hylaeus* FABRICIUS.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser. vol. 25, p. 169, 1939.

Obertobombus REINIG.

Zeitschr. Morph.-Ökol. Tiere, vol. 17, p. 107, 1930.

Type.—*Bombus oberti* MORAWITZ, 1883. (Monobasic.) (*Obertobombus oberti* Reinig, 1930, not *Bombus oberti* Morawitz, 1883) = *Subterraneobombus pamirus* Skorikov, 1912, according to Skorikov, Leningrad, Akad. Nauk., Trudl pamiirskoi eskped., No. 8, p. 229, 1931. However, *oberti* Morawitz must be retained as type unless the International Commission rules otherwise in this case (see Opinion 65).

Proposed as a subgenus of *Bombus* Latreille.

Odontalictus ROBERTSON.

Ent. News, vol. 29, p. 91, 1918.

Type.—*Halictus ligatus* SAY, 1837. (Monobasic and original designation.)

Odontochlora SCHROTTKY.

Rev. Mus. La Plata, vol. 16 (ser. 2, vol. 3), p. 141, 1909. Eight species.

Type.—*Augochlora muelleri* COCKERELL, 1900. (Original designation.)

Synonym of *Augochlora* F. Smith, according to Sandhouse, Journ. Washington Acad. Sci., vol. 27, p. 66, 1937.

Odontostelis COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 8, p. 542, 1931. Two species.

Type.—(*Stelis abnormis* FRIESE, 1925) = (*Anthidium*) *Stelis* (*Odontostelis*) *bivittatum* (Cresson), 1878. (Original designation.)

Proposed as a subgenus of *Stelis* Panzer.

Odyneropsis SCHROTTKY.

Rev. Mus. Paullista, vol. 5, p. 432, 1903.

Type.—*Odyneropsis holosericea* SCHROTTKY, 1903. (Monobasic and original designation.)

Oediscelis PHILIPPI.

Stettin. Ent. Zeit., vol. 27, p. 109, 1866. Two species.

Type.—*Oediscelis vernalis* PHILIPPI, 1866. (By designation of Cockerell, Proc. U. S. Nat. Mus., vol. 55, p. 185, 1919.)

(*Oestropsis* F. SMITH, not BRAUER, 1868) = *Gastropsis* F. SMITH.

Trans. Ent. Soc. London, p. 253, 1868.

Type.—*Oestropsis pubescens* F. SMITH, 1868. (Monobasic.)

Oligotropus ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 168 and 171, 1903.

Type.—*Oligotropus campanulae* ROBERTSON, 1903. (Monobasic and original designation.)

Synonym of *Chelostomoides* Robertson, according to Mitchell, Trans. Amer. Ent. Soc., vol. 59, pp. 298 and 300, 1934.

Omachtes GERSTAECKER (=Homachthes DALLA TORRE).

Stettin. Ent. Zeit., vol. 30, p. 154, 1869. Three species.

Type.—(*Omachtes carnifex* GERSTAECKER, 1869)=*Ammobates dichros* Spinola, 1848. (Present designation.)

Opandrena ROBERTSON.

Trans. Amer. Ent. Soc., vol. 28, pp. 187, 188, and 193, 1902. Six species.

Type.—*Andrena cressonii* ROBERTSON, 1891. (Original designation.)

(Orbitella MA, not DOUVILLE, 1915)=Euryapis, new name.

Rec. Indian Mus., vol. 40, pp. 270 and 305, 1938. Eight species.

Type.—*Xylocopa confusa* PÉREZ, 1901. (Original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

Oreopasites COCKERELL.

Bull. Amer. Mus. Nat. Hist., vol. 22, p. 442, 1906.

Type.—*Oreopasites scituli* COCKERELL, 1906. (Monobasic.)

Orientalibombus RICHARDS.

Ann. Mag. Nat. Hist., ser. 10, vol. 3, p. 378, 1929. Five species.

Type.—*Bombus orientalis* F. SMITH, 1854. (Original designation.)

Orphana VACHAL (=Leptoglossa FRIESE, 1925, not KLUG, 1839; Ptoleglossa FRIESE).

Rev. d'Ent. France, vol. 28, pp. 35 and 38, 1909.

Type.—*Orphana inquirenda* VACHAL, 1909. (Monobasic.)

Isogenotypic with *Leptoglossa* Friese through synonymy.

Ptoleglossa was proposed for *Leptoglossa* Friese, preoccupied.

Osiris F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 288, 1854.

Two species.

Type.—*Osiris pallidus* F. SMITH, 1854. (Present designation.)

Osmia PANZER (=Amblys KLUG; Ceratosmia THOMSON; Pachyosmia DUCKE), Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 230, 1806.

Seven species.

Type.—(*Anthophora bicornis* (FABRICIUS), 1804=*Apis bicornis* LINNAEUS, 1758)=*Apis rufa* LINNAEUS, 1758. (By designation of Latreille, *Considérations générales . . . des insectes*, p. 439, 1810.) *Osmia tricornis* Latreille, 1811, designated by Blanchard, in Cuvier, *Règne Animal* [ed. 3], insectes, text vol. 2, p. 210; atlas pl. 127, fig. 3, [1849], was not originally included.

Isogenotypic with *Amblys* Klug, *Ceratosmia* Thomson, and through synonymy with *Pachyosmia* Ducke.

Oxaea KLUG (=Dasyglossa ILLIGER).

Mag. Ges. naturf. Freunde Berlin, vol. 1, p. 261, 1807.

Type.—*Oxaea flavescens* KLUG, 1807. (Monobasic.)

Isogenotypic with *Dasyglossa* Illiger.

Oxyhalictus COCKERELL AND IRELAND.

Ann. Transvaal Mus., vol. 17, p. 91, 1935.

Type.—*Halictus (Oxyhalictus) acuficus* COCKERELL AND IRELAND, 1935. (Monobasic.)

Proposed as a subgenus of *Halictus* Latreille.

(Oxynedys SCHROTTKY)=Hopliophora LEPELETIER.

Rev. Mus. Paulista, vol. 5, p. 491, 1903.

Type.—(*Oxynedys veroni* SCHROTTKY, 1903)=(*Mesochetira*) *Hopliophora velutina* LEPELETIER AND SEVILLE, 1825. (Monobasic and original designation.)

Isogenotypic with *Hopliophora* Lepeletier through synonymy.

Oxystoglossa F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 83, 1853.

Type.—*Oxystoglossa decorata* F. SMITH, 1853. (Monobasic.)

Synonym of *Augochlora* F. Smith, according to Ashmead, Trans. Amer. Ent. Soc., vol. 26, p. 91, 1899; and Sandhouse, Journ. Washington Acad. Sci., vol. 27, p. 75, 1937.

Oxytrigona COCKERELL.

Psyche, vol. 24, p. 124, 1917.

Type.—*Trigona mediorufa* COCKERELL, 1913. (Monobasic and original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Pachyanthidium FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 5, p. 66, 1905. Ten species.

Type.—*Anthidium bicolor* LEPELETIER, 1841. (By designation of Cockerell, Ann. Durban Mus., vol. 2, p. 298, 1920.)

Proposed as a subgenus of *Anthidium* Fabricius.

Pachycentris FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 2, p. 186, 1902.

Type.—*Pachycentris schrottkyi* FRIESE, 1902. (Monobasic.)

Pachycerapis COCKERELL.

Amer. Mus. Novitates, no. 47, p. 4, 1922. Two species.

Type.—*Eomalopsis* (*Pachycerapis*) *cornigera* COCKERELL, 1922. (Original designation.)

Proposed as a subgenus of *Eomalopsis* Spinola.

Pachyhalictus COCKERELL.

Ann. Mag. Nat. Hist., ser. 10, vol. 4, p. 589, 1929. Three species.

Type.—*Halictus merescens* COCKERELL, 1919. (Original designation.)

Proposed as a subgenus of *Halictus* Latreille for the "*Halicti nomiiformes*" of Vachal and Blüthgen.

Pachymelopsis COCKERELL.

Trans. Amer. Ent. Soc., vol. 31, p. 331, 1905.

Type.—*Pachymelus conspicuus* F. SMITH, 1879. (Monobasic and original designation.)

Proposed as a subgenus of *Pachymelus* F. Smith.

Pachymelus F. SMITH.

Descriptions of new species of Hymenoptera . . . British Museum, p. 116, 1879. Two species.

Type.—*Pachymelus microlephas* F. SMITH, 1879. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 31, p. 330, 1905, who transferred *P. conspicuus* F. Smith to *Pachymelopsis* Cockerell, as genotype, leaving only *microlephas* in *Pachymelus*.) (See Opinion 6, by the International Commission on Zoological Nomenclature.)

(Pachyosmia DUCKE) = Osmia PANZER.

Ber. naturw.-med. Ver. Innsbruck, vol. 25, p. 18, 1900. Ten species.

Type.—(*Apis*) *Osmia rufa* (LINNAEUS), 1758. (By designation of Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 9, 1939.)

Proposed as a subgenus of *Osmia* Panzer.

Isogenotypic through synonymy with *Osmia* Panzer, *Amblys* Klug, and *Cera-tosmia* Thomson.

Pachyprosopis PERKINS.

Proc. Hawaiian Ent. Soc., vol. 2, p. 29, 1908.

Type.—*Pachyprosopis mirabilis* PERKINS, 1908. (Monobasic.)

(*Paedia* DALLA TORRE) for *Paidia* RADOSZKOWSKI.

Ber. naturw.-med. Ver. Innsbruck, p. 147, 1891.

(*Paidia* RADOSZKOWSKI, not HERRICH-SCHAEFER, 1847) = *Ammobatoides* RADOSZKOWSKI.

Bull. Soc. Imper. Nat. Moscou, vol. 45, pt. 1, p. 10, 1872.

Horae Soc. Ent. Ross., Bull. vol. 8, p. xxi, (1871), 1872.

Type.—*Phileremus abdominalis* EVERSMANN, 1852. (Autobasic.)

Paidia was proposed unnecessarily by Radoszkowski for *Ammobatoides* Radoszkowski, not Schenck, and is itself preoccupied.

Palaeorhiza PERKINS.

Proc. Hawaiian Ent. Soc., vol. 2, p. 29, 1908.

Type.—*Prosopis perviridis* COCKERELL, 1905. (Monobasic and original designation.)

Palinepeolus HOLMBERG (=Calospiloma BRÈTHES).

Apuntes Hist. Nat. Buenos Aires, vol. 1, p. 77, 1909. Two species.

Type.—*Epeolus viperinus* HOLMBERG, 1886. (Original designation.)

Isogenotypic with *Calospiloma* Brèthes.

Panurginus NYLANDER.

Notis. Sallsk. Fauna Flora Fennica, vol. 1, p. 223, 1848.

Type.—*Panurginus niger* NYLANDER, 1848. (Monobasic.)

Panurgomia VIERECK.

Proc. Ent. Soc. Washington, vol. 11, p. 48, 1909.

Type.—*Panurgomia fuchsi* VIERECK, 1909. (Monobasic.)

Panurgus PANZER (=Eriops KLUG).

Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 209, 1806.

Two species.

Type.—(*Dasypoda lobata* FABRICIUS, 1804 = *Andrena lobata* PANZER, 1799) = *Apis calcarata* SCOPOLI, 1763. (By designation of Latreille, *Considérations générales . . . des insectes*, p. 439, 1810.) *Apis ursina* Gmelin, 1790, designated by Westwood, *An introduction to the modern classification of insects*, vol. 2, *Synopsis of the genera of British insects*, p. 85, 1840, is a synonym of *calcarata*. (*Panurgus ater* Fabricius = *Trachusa atra* Panzer, 1804) = *Apis banksiana* Kirby, 1802, designated by Blanchard, in Cuvier, *Règne Animal*, [ed. 3], *Insectes*, text vol. 2, p. 206; atlas pl. 126, fig. 3 [1849].

Isogenotypic with *Eriops* Klug.

Paraanthidium FRIESE.

Die Bienen Europas, vol. 4, p. 101, 1898. Eight species.

Type.—*Apis interrupta* FABRICIUS, 1781. (By designation of Cockerell. Ent. Rec., vol. 21, p. 270, 1909.)

Proposed as a subgenus of *Anthidium* Fabricius.

Paracentris CAMERON.

Trans. Amer. Ent. Soc., vol. 29, p. 235, 1903.

Type.—*Paracentris fulvohirta* CAMERON, 1903. (Monobasic.)

Paracoelioxys GRIBODO.

Bull. Soc. Ent. Italiana, vol. 16, p. 274, 1884.

Type.—*Coelioxys montandoni* GRIBODO, 1884. (Monobasic.)

Proposed as a subgenus of *Coelioxys* Latreille.

- (*Paracoelioxys* RADSKOWSKI, not GRIBODO, 1884) = *Liothyrapis* COCKERELL.
 Horae Soc. Ent. Ross., vol. 27, p. 53, 1893. Two species.
 Type.—*Paracoelioxys barrei* RADSKOWSKI, 1893. (Present designation.)
Coelioxys decipiens Spinola, 1838, designated by Alfken, Deutsche Ent. Zeitschr., p. 433, 1938, was not originally included.
 Proposed as a subgenus of *Coelioxys* Latreille.
Paracoelioxys Radoszkowski is preoccupied and ordinarily would require a new name, but since, according to Alfken, Bull. Soc. Roy. Ent. Egypte, vol. 18, p. 178, 1934, it is a synonym of *Liothyrapis* Cockerell, none is proposed to replace it.
- Paracolletes** F. SMITH.
 Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 6, 1853.
 Type.—*Paracolletes crassipes* F. SMITH, 1853. (Monobasic.)
- Paracrocisa** ALFKEN.
 Konowia, vol. 16, p. 173, 1937.
 Type.—*Paracrocisa sinaitica* ALFKEN, 1937. (Monobasic.)
- Paradioxys** MOCSARY.
 Term. Fuz. vol. 17, p. 35, 1894.
 Type.—*Dioxys pannonica* MOCSARY, 1877. (Monobasic.)
- Parafidelia** BRAUNS.
 Zool. Jahrb., Abt. Syst., Jena, vol. 52, p. 202, 1926.
 Type.—*Parafidelia friesei* BRAUNS, 1926. (Monobasic.)
- Parafriesea** SCHROTTKY (= *Friesea* SCHROTTKY, 1903, not DALLA TORRE, 1895).
 Zeitschr. Syst. Hym. Dipt., vol. 6, p. 118, 1906.
 Type.—(*Friesea brasiliensis* SCHROTTKY, 1903) = (*Calliopsis*) *Camptopoeum flavifrons* (F. SMITH), 1853. (Autobasic.)
 Synonym of *Camptopoeum* Spinola, according to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 86, 1912.
- Paragapostemon** VACHAL.
 Misc. Ent., vol. 11, pp. 89 and 90, 1903. Many species.
 Type.—*Halictus* (*Paragapostemon*) *podager* VACHAL, 1903. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 31, p. 354, footnote, 1905.)
 Proposed as a subgenus of *Halictus* Latreille.
- Parahalictoides** COCKERELL AND PORTER.
 Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 420, 1899. Three species.
 Type.—*Halictoides campanulae* COCKERELL, 1897. (Original designation.)
 Proposed as a subgenus of *Halictoides* Nylander.
- Paralictus** ROBERTSON.
 Can. Ent., vol. 33, p. 229, 1901. Three species.
 Type.—(*Halictus cephalicus* ROBERTSON, 1892, not Morawitz, 1873) = *Halictus cephalotes* Dalla Torre, 1896. (Original designation.)
- Paramacropis** POPOV AND GUIGLIA.
 Ann. Mus. Civ. Stor. Natur., Genova, vol. 59, p. 287, 1936.
 Type.—*Otenoplectra ussuriensis* POPOV, 1936. (Monobasic.)
 Proposed as a subgenus of *Macropis* Panzer.
- (*Paramegachile* FRIESE) = *Eutricharaea* THOMSON.
 Term. Fuz., vol. 21, p. 198, 1898. No species.
 Die Bienen Europas, vol. 5, p. 34, 1899. Many species.
 Type.—*Apis argentata* FABRICIUS, 1793. (By designation of Mitchell, Trans. Amer. Ent. Soc., vol. 59, p. 298, 1934.)
 Proposed as a subgenus of *Megachile* LATREILLE.
 Isogenotypic with *Eutricharaea* Thomson.

(*Paramegalochila* SCHULZ) for *Paramegachile* FRIESE.

Spolia hymenopterologica, p. 71, 1906.

Paramegilla FRIESE.

Die Bienen Europas, vol. 3, pp. 5, 18, and 25, 1897. Six species.

Type.—(*Apis*) *Podalirius* (*Paramegilla*) *treos* (PALLAS), 1773. (Present designation.)

Proposed as a subgenus of *Podalirius* Latreille.

Parammobates FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 118, 1906.

Type.—*Parammobates brasiliensis* FRIESE, 1906. (Monobasic.)

Parammobatodes POPOV.

Ann. Mus. Zool. Acad. Sci. U. R. S. S., vol. 32, p. 462, 1932.

Type.—*Phiurus minutus* MOCSARY, 1878. (Monobasic.)

Parandrena ROBERTSON.

Trans. Acad. Sci. St. Louis, vol. 7, p. 337, 1897. Two species.

Type.—*Panurgus andrenoides* CRESSON, 1878. (By designation of Cockerell, *Can. Ent.*, vol. 29, p. 28, 1897.)

Paranomada LINSLEY AND MICHENER.

Pan-Pacific Ent., vol. 13, p. 82, 1937.

Type.—*Paranomada nitida* LINSLEY AND MICHENER, 1937. (Monobasic and original designation.)

(*Paranomia* FRIESE, not CONRAD, 1860) = *Nomia* LATREILLE.

Festschr. fünfzig. bestehene Ver. Schles. Insektenk. Breslau, p. 48, 1897. Four species.

Type.—*Nomia chalybeata* F. SMITH, 1875. (By designation of Cockerell, *Proc. U. S. Nat. Mus.*, vol. 38, p. 290, 1910.)

Proposed as a subgenus of *Nomia* Latreille.

Synonym of *Nomia* Latreille, according to Mende-Waldo, *Ann. Mag. Nat. Hist.*, ser. 8, vol. 17, p. 454, 1916; accordingly, no new name is proposed to replace *Paranomia* Friese which is preoccupied.

Paranthidium COCKERELL AND COCKERELL.

Ann. Mag. Nat. Hist. ser. 7, vol. 7, p. 50, 1901.

Type.—*Anthidium perpictum* COCKERELL, 1808. (Monobasic.)

Proposed as a subgenus of *Anthidium* Fabricius.

Parapolyglossa BRAUNS.

Zeitschr. Wiss. Insektenbiol., vol. 24, p. 134, 1929. Two species.

Type.—*Polyglossa heterodoxa* COCKERELL, 1921. (Original designation.)

Proposed as a subgenus of *Polyglossa* Friese.

Paraprosopis POPOV.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser. vol. 25, p. 169, 1939.

Type.—(*Hylacus*) *Prosopis pictipes* (NYLANDER), 1852. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius to replace *Campanularia* Méhely which, however, is invalid.

Campanularia Méhely, not Lamarck, 1816, was proposed by Méhely, *Naturgeschichte der Urbienen*, pp. 50 and 157, 1935, as a subgenus of *Prosopis* Fabricius to include seven species, but according to Article 25c (amendment) it has no validity from that date since no genotype was designated.

Parapsaenythia FRIESE.

Flora og Fauna Aarbog, vol. 10, p. 42, 1908.

Type.—*Psaenythia* (*Parapsaenythia*) *argentina* FRIESE, 1908. (Monobasic.)

Proposed as a subgenus of *Psaenythia* Gerstaecker.

Pararhophites FRIESE.

Term. Fuz., vol. 21, p. 305, 1898.

Type.—*Rhophites* (*Pararhophites*) *quadratus* FRIESE, 1898. (Monobasic.)

Proposed as a subgenus of *Rhophites* [*Rophites*] Spinola.

Parasphecodes F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 39, 1853.

Twelve species.

Type.—*Parasphecodes hilaetus* F. SMITH, 1853. (Present designation.)

Parathrincostoma BLÜTHGEN.

Mitt. Zool. Mus. Berlin, vol. 18, p. 389, 1933.

Type.—*Parathrincostoma seyrigi* BLÜTHGEN, 1933. (Monobasic and original designation.)

Paratrigona SCHWARZ.

Bull. Amer. Mus. Nat. Hist., vol. 74, p. 487, 1938. Three species.

Type.—(*Melipona*) *Trigona* (*Paratrigona*) *prosopiformis* (GRIBODO), 1893. (Original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Paraugochlora SCHROTTKY (=Augochloropsis SCHROTTKY, 1909, not COCKERELL, 1897).

Deutsche Ent. Zeitschr., p. 540, 1910.

Type.—*Augochlora spinolae* COCKERELL, 1900. (Autobasic and original designation.)

Paraugochloropsis SCHROTTKY.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 312, 1906.

Type.—*Augochloropsis* (*Paraugochloropsis*) *lycorias* SCHROTTKY, 1906. (Monobasic.)

Proposed as a subgenus of *Augochloropsis* Cockerell for the "*Halicti vibrissati*" of Vachal, but only the single species listed.

Synonym of *Augochloropsis* Cockerell, according to Sandhouse, Journ. Washington Acad. Sci., vol. 27, pp. 65 and 71, 1937.

Parepeolus DUCKE.

Zool. Jahrb., Abt. Syst., Jena, vol. 34, pp. 71 and 102, 1912. Two species.

Type.—*Leiopodus leointei* DUCKE, 1908. (Present designation.)

Parevaspis RITSEMA.

Tijdschr. Ent., vol. 17, p. lxxi, 1874. Three species.

Type.—*Parevaspis basalis* RITSEMA, 1874. (Present designation.)

Partamona SCHWARZ (=Patera SCHWARZ, 1938, not LESSON, 1837, not ALBERS, 1850).

Ent. News, vol. 50, p. 23, 1939.

Type.—*Melipona testacea* KLUG, 1807. (Autobasic.)

(Pasiphae SPINOLA, not LATREILLE, 1819) = Brachyglossula HEDICKE.

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 226, 1851. Four species.

Type.—*Pasiphae caerulescens* SPINOLA, 1851. (Present designation.)

Pasiphae Spinola is preoccupied but since it is considered to be synonymous with *Brachyglossula* no new name is proposed to replace it.

Pasites JURINE.

Nouvelle méthode de classer les hyménoptères et les diptères, vol. 1, p. 224, 1807. Two species.

Type.—*Pasites maculata* JURINE, 1807. (Original designation.) (*Nomada schottii* Fabricius, 1804) = (*Tiphia*) *Biastes brevicornis* (Panzer), 1798, designated by Latreille, Considérations générales . . . des insectes, p. 439, 1810.

Pasitomachtes BISCHOFF.

Deutsche Ent. Zeitschr., p. 596, 1923. Two species.

Type.—*Pasitomachtes nigerrimus* BISCHOFF, 1923. (Original designation.)

Patellapis FRIESE.

In Schultze, Zool. u. anthropol. Ergebn. Forschungsreise Südafrika, vol. 2, pp. 127 and 148, 1909. Three species.

Type.—*Halictus (Patellapis) schultzei* (FRIESE), 1909. (By designation of Cockerell, Ann. Durban Mus., vol. 2, p. 311, 1920.)

Proposed as a subgenus of *Halictus* Latreille.

(*Patera* SCHWARZ, not LESSON, 1837, not ALBERS, 1850) = *Partamona* SCHWARZ. Bull. Amer. Mus. Nat. Hist., vol. 74, p. 475, 1938.

Type.—*Melipona testacea* KLUG, 1807. (Monobasic and original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Pavostelis SLADEN.

Can. Ent., vol. 48, p. 313, 1916.

Type.—*Stelis montana* CRESSON, 1864. (Monobasic.)

Proposed as a subgenus of *Stelis* Panzer.

Pectinata MÉHELY.

Naturgeschichte der Urbielen, pp. 54 and 161, 1935. Thirteen species.

Proposed as a subgenus of *Prosopis* Fabricius, but invalid under Article 25c (amendment) of the International Rules of Zoological Nomenclature, since no genotype was designated.

(*Pectinata* POPOV) = *Hylaeus* FABRICIUS.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 169, 1939.

Type.—(*Apis*) *Prosopis annulata* (LINNAEUS), 1758. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* Fabricius.

Isogenotypic with *Hylaeus* Fabricius and *Trichota* Popov.

Pectinata was first proposed by Méhely, Naturgeschichte der Urbielen, pp. 54 and 161, 1935, as a subgenus of *Prosopis* Fabricius to include thirteen species, but according to Article 25c (amendment) it has no validity from that date since no genotype was designated.

Pelandrena COCKERELL [fossil].

Ent. News. vol. 20, p. 159, 1909.

Type.—*Pelandrena reducta* COCKERELL, 1909. (Monobasic.)

Pentaperdita COCKERELL and PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 414, 1899.

Type.—*Perdita albotittata* COCKERELL, 1895. (Monobasic.)

Proposed as a subgenus of *Perdita* F. Smith.

Peponapis ROBERTSON.

Can. Ent., vol. 34, p. 324, 1902.

Type.—*Macrocera pruinosa* SAY, 1836. (Monobasic and original designation.)

Synonym of *Xenoglossa* F. Smith, according to Cockerell, Trans. Amer. Ent. Soc., vol. 32, p. 104, 1906.

Perdita F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 128, 1853.

Type.—*Perdita halictoides* F. SMITH, 1853. (Monobasic.)

Perditella COCKERELL.

Psyche, vol. 8, p. 312, 1899. Three species.

Type.—(*Perdita laneae* COCKERELL, 1899)=*Perdita larreae* COCKERELL, 1896. (Original designation.)

Proposed as a subgenus of *Perdita* F. Smith.

Perditomorpha ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 86, 1899.

Type.—*Perditomorpha brunerii* ASHMEAD, 1899. (Monobasic and original designation.)

(*Pérezia* FERTON, not LÉGER and DUBOSCQ, 1909)=*Fertonella* COCKERELL.

Ann. Soc. Ent. France, vol. 83, p. 233, 1914.

Type.—*Pérezia maura* FERTON, 1914. (Monobasic.)

Phaenosarus MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 303 and 309, 1934. Two species.

Type.—*Megachile fortis* CRESSON, 1872. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Phenacolletes COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 301, 1905.

Type.—*Phenacolletes mimus* COCKERELL, 1905. (Monobasic.)

(*Phiarus* GERSTAECKER)=*Ammobatoides* RADOSZKOWSKI.

Stettin. Ent. Zelt., vol. 30, p. 147, 1869.

Type.—*Phileremus abdominalis* EVERSMAHN, 1852. (Monobasic.)

Isogenotypic with *Ammobatoides* Radoszkowski and *Paidia* Radoszkowski.

Phileremulus COCKERELL.

Psyche, vol. 7, suppl., p. 9, 1895. Two species.

Type.—*Phileremulus vigilans* COCKERELL, 1895. (Original designation.)

Phileremus LATREILLE (= *Ammobatoides* SCHENCK, 1868, not Radoszkowski, 1867).

Genera crustaceorum et insectorum . . . , vol. 4, p. 169, 1809. Two species.

Type.—(*Epeolus punctatus* FABRICIUS, 1804)=*Epeolus kirbyanus* LATREILLE, 1803. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.) *Phileremus oraniensis* Lepeletier, 1841, designated by Blanchard, in Cuvier, Règne Animal [ed. 3], insectes, text vol. 2, p. 213; atlas pl. 128, fig. 1, [1849], was not originally included.

Isogenotypic with *Ammobatoides* Schenck through synonymy.

Philoxanthus ASHMEAD.

Psyche, vol. 8, p. 285, 1898.

Type.—*Perdita beata* COCKERELL, 1896. (Monobasic and original designation.)

Phor ROBERTSON.

Can. Ent., vol. 35, pp. 174, 175, and 177, 1903.

Type.—(*Nomada integra* ROBERTSON, 1893, not BRILLÉ, 1832)=*Nomada integerrima* DALLA TORRE, 1896. (Original designation.)

(*Phyllotoma* DUMÉNIL, not LEACH, 1819, not FALLÉN, 1829)=*Anthocopa* LEPELETIER AND SERVILLE.

Mem. Acad. Sci. Inst. Imp. France, vol. 31, p. 842, 1860. Five species.

Type.—*Apis papaveris* LATREILLE, 1799. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 160, 1941.)

Isogenotypic with *Anthocopa* Lepeletier and Serville and *Furcosmia* Schmiedeknecht.

Phyllotoma Dumeril is preoccupied, but since it falls as a synonym of *Anthocopa* no new name is proposed to replace it.

Physostetha MICHENER.

Ann. Ent. Soc. Amer., vol. 31, pp. 515 and 523, 1938. Five species.

Type.—*Heriades carinata* CRESSON, 1864. (Original designation.)

Proposed as a subgenus of *Heriades* Spinola.

Pithitis KLUG.

Magazin für Insektenkunde, vol. 6, pp. 198 and 225, 1807.

Type.—(*Apis*) *Megilla smaragdula* (FABRICIUS), 1787. (Monobasic.)

Synonym of *Ceratina* Latreille, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 195, 1896.

Plastandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 217, 1933. Eleven species.

Type.—(*Melitta*) *Andrena tibialis* (KIRBY), 1802. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Platandrena VIERECK.

Can. Ent., vol. 56, p. 21, 1924.

Type.—(*Andrena* *nasoni* ROBERTSON, 1895) = *Andrena vestita* PROVANCHER, 1888. (Monobasic and original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Platynopoda WESTWOOD (= *Audinetia* LEPELETIER).

In W. Jardine, Naturalist's Library, vol. 26, Entomology, vol. 6, Bees, p. 271, 1840. Two species.

Type.—(*Xylocopa latipes* FABRICIUS, 1804) = *Apis latipes* DRURY, 1773. (By designation of Ashmead, Trans. Amer. Ent. Soc., vol. 26, p. 71, 1899.)

Proposed as a subgenus of *Xylocopa* Latreille.

Isogenotypic with *Audinetia* Lepeletier.

Synonym of *Xylocopa* Latreille, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 202, 1896.

Plebeia SCHWARZ.

Bull. Amer. Mus. Nat. Hist., vol. 74, p. 480, 1938. Two species.

Type.—*Trigona mosquito* F. SMITH, 1863. (Original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Plesianthidium CAMERON.

Trans. South African Philos. Soc., vol. 15, p. 256, 1905.

Type.—*Plesianthidium fulvopilosum* CAMERON, 1905. (Monobasic.)

Plesiopanurgus CAMERON.

Journ. Bombay Nat. Hist. Soc., vol. 18, p. 130, 1907.

Type.—*Plesiopanurgus cinerarius* CAMERON, 1907. (Monobasic.)

(Plistotrichia MORAWITZ) = *Ancyla* LEPELETIER.

Horae Soc. Ent. Ross., vol. 10, p. 134, 1873.

Type.—(*Nomia flavilabris* LUCAS, 1846) = *Ancyla oraniensis* LEPELETIER, 1841. (Monobasic.)

Isogenotypic with *Ancyla* through synonymy.

(Plusia HOFFMANNSEGG, not HÜBNER, 1806, not OCHSENHEIMER, 1816) = *Euglossa* LATREILLE.

Zool. Mag., vol. 1, p. 52, 1817.

Type.—*Plusia superba* HOFFMANNSEGG, 1817. (Monobasic.)

Plusia Hoffmannsegg is preoccupied, but since it was placed as a synonym of *Euglossa* Latreille by Friese, Zeitschr. Syst. Hym. Dipt., vol. 4, p. 99, 1904, no new name is proposed to replace it.

Podalirius LATREILLE (=Anthophora LATREILLE).

Histoire naturelle de fourmis, pp. 415 and 429, 1802. Five species.

Type.—(*Apis pilipes* FABRICIUS, 1775)=*Apis acervorum* LINNAEUS, 1758.
(Autobasic with *Anthophora*.)

A proposal is before the International Commission to place *Anthophora* Latreille on the Official List of Generic Names. Approval would result in the suppression of *Podalirius* Latreille and *Lasius* Panzer, 1804.

(Podasys RAFINESQUE)=Dasypoda LATREILLE.

Analyse de la nature . . . , p. 123, 1815.

Type.—*Andrena hirtipes* FABRICIUS, 1793. (Autobasic.)

Proposed unnecessarily for *Dasypoda* Latreille.

Poecilandrena HEDIOKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 218, 1933. Many species.

Type.—*Andrena labiata* FABRICIUS, 1781. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Poecilobombus DALLA TORRE.

Ber. naturw.-med. Ver., Innsbruck, vol. 12, p. 23, 1882. Three species.

Type.—*Bombus sitkensis* NYLANDER, 1848. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Poecilocentris FRIESE.

Ann. Nat. Hofmus. Wien, vol. 15, p. 244, 1900. Six species.

Type.—*Centris* (*Poecilocentris*) *fasciatella* FRIESE, 1900. (Present designation.)

Proposed as a subgenus of *Centris* Fabricius.

Poecilomelitta FRIESE.

Deutsche Ent. Zeitschr., p. 574, 1913. Two species.

Type.—*Poecilomelitta flavida* FRIESE, 1913. (Present designation.)

Policana FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 29, p. 651, 1910. Three species.

Type.—*Colletes* (*Policana*) *herbsti* FRIESE, 1910. (Present designation.)

Proposed as a subgenus of *Colletes* Latreille.

Polybiapis COCKERELL.

Ent. News, vol. 27, p. 208, 1916. Two species.

Type.—*Polybiapis mimus* COCKERELL, 1916. (Original designation.)

Polyglossa FRIESE.

In Schultze, Zool. und anthropol. Ergebn. Forschungsreise Südafrika, vol. 2, p. 123, 1909. Four species.

Type.—*Polyglossa albitarsis* FRIESE, 1909. (Present designation.)

(Pomobombus KRÜGER)=Rhodobombus DALLA TORRE.

Ent. Mitt., vol. 6, p. 65, 1917. Two species.

Type.—(*Bremus*) *Bombus pomorum* (PANZER), 1804. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Rhodobombus* Dalla Torre.

Pratobombus VOGT.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 49, 1911. Eight species.

Type.—(*Apis*) *Bremus pratorum* (LINNAEUS), 1761. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 67, 1927.)

Proposed as a subgenus of *Bombus* Latreille.

Presbia SPINOLA.

Historia física y política de Chile . . . por Claudio Gay, Zool., vol. 6, p. 209, 1851.

Type.—*Halictus gayatinus* SPINOLA, 1851. (Monobasic.)

Pressibombus FRISON.

Rec. Indian Mus., vol. 37, p. 342, 1935.

Type.—*Bremus (Pressibombus) pressus* FRISON, 1935. (Monobasic and original designation.)

Proposed as a subgenus of *Bremus* Jurine.

Proanthidium FRIESE.

Die Bienen Europas, vol. 4, p. 101, 1898. Many species.

Type.—*Anthidium oblongatum* LATREILLE, 1809. (By designation of Cockerell, Ent. Rec., vol. 21, p. 269, 1909.)

Proposed as a subgenus of *Anthidium* Fabricius.

Prochelostoma ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 167 and 171, 1903.

Type.—*Heriades philadelphi* ROBERTSON, 1901. (Monobasic and original designation.)

Prodiorys FRIESE.

Stettin. Ent. Zeit., vol. 75, p. 221, 1914.

Type.—*Prodiorys cinnabarina* FRIESE, 1914. (Monobasic.)

(Prosapis ASHMEAD) for Prosopis FABRICIUS.

Psyche, vol. 7, p. 43, 1894.

Prosopalictus STRAND.

Suppl. Ent., No. 2, p. 26, 1913.

Type.—*Prosopalictus micans* STRAND, 1913. (Monobasic.)

(Prosopis JURINE)=Prosopis FABRICIUS, 1804.

Erlangen Litteratur-Zeitung, vol. 1, p. 164, 1801. Four species.

Type.—(*Sphex signatus* PANZER, 1798)=*Mellinus bipunctatus* FABRICIUS, 1798. (By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 416, 1915.)

Isogenotypic with *Prosopis* Fabricius and *Auricularia* Popov.

Suppressed through rejection of the "Erlangen List" (Opinion 135).

Prosopis FABRICIUS (=Prosopis JURINE, 1801; Prosopis JURINE, 1807; Auricularia POPOV, 1939, not BLAINVILLE, 1816, not DEFRANCE, 1816, not FABRICIUS, 1823, not MÜLLER, 1850).

Systema Piezatorum, p. 293, 1804. Fourteen species.

Type.—(*Sphex signatus* PANZER, 1798)=*Mellinus bipunctatus* FABRICIUS, 1798. (By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 416, 1914.)

Isogenotypic with *Prosopis* Jurine, 1807, and through synonymy with *Auricularia* Popov.

Prosopis Fabricius has been validated through suppression of the "Erlangen List" (Opinion 135) which included *Prosopis* Jurine, 1801.

Synonym of *Hylaeus* Fabricius, according to Morice and Durrant.

A proposal has been placed before the International Commission to add *Prosopis* Jurine, 1807, Nouvelle méthode de classer les hyménoptères et les diptères, with "*Sphex signator* Panzer, 1798" as genotype to the Official List of Generic Names. (See Science, vol. 83, p. 552, 1936.) This would result in the suppression of *Hylaeus* Fabricius and *Prosopis* Fabricius, 1804.

(Prosopis JURINE) = Prosopis FABRICIUS, 1804.

Nouvelle méthode de classer les hyménoptères et les diptères, p. 218, 1807.

Type.—(*Spheca signata* PANZER, 1798) = *Mellinus bipunctatus* FABRICIUS, 1798.

(By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 416, 1914.)

Isogenotypic with *Prosopis* Fabricius and through synonymy with *Auricularia* Popov. A proposal has been placed before the International Commission to add *Prosopis* Jurine, 1807, Nouvelle méthode de classer les hyménoptères et les diptères, with "*Spheca signator* Panzer, 1798" as genotype to the Official List of Generic Names. (See Science, vol. 83, p. 552, 1936.) This would result in the suppression of *Hylaeus* Fabricius and *Prosopis* Fabricius, 1804.

Prosopistemon COCKERELL.

Entomologist, vol. 39, p. 17, 1906.

Type.—*Prosopistemon scrocinellum* COCKERELL, 1906. (Monobasic.)

Prosopoides FRIESE.

Flora og Fauna Aarborg, p. 10, 1908.

Type.—(*Prosopoides paradoxus* FRIESE, 1908) = *Oediscelis prosopoides* DUCKE, 1907. (Monobasic.)

Synonym of *Oediscelis* Philippi, according to FRIESE, (loc. cit.) and to Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 83, 1912.

Protandrena COCKERELL.

Ann. Mag. Nat. Hist., ser. 6, vol. 13, p. 91, 1896. Five species.

Can. Ent., vol. 28, p. 184, 1896. Five species.

Type.—*Andrena maurula* COCKERELL, 1896. (Present designation.)

Protandrenopsis CRAWFORD.

Can. Ent., vol. 35, p. 337, 1903.

Type.—*Protandrenopsis fuscipennis* CRAWFORD, 1903. (Monobasic and original designation.)

Synonym of *Pseudopanurgus* COCKERELL, according to Cockerell, Ann. Mag. Nat. Hist., ser. 7, vol. 14, p. 26, 1904.

Proanthidium COCKERELL AND COCKERELL.

Ann. Mag. Nat. Hist., ser. 7, vol. 7, p. 49, 1901.

Type.—*Megachile steloides* BINGHAM, 1896. (Monobasic and original designation.)

Synonym of *Paraanthidium* FRIESE, according to Mavromoustakis, Ann. Mag. Nat. Hist., ser. 10, vol. 19, p. 155, 1937; ser. 11, vol. 3, p. 90, 1939.

Protepeolus LINSLEY AND MICHENER.

Pan-Pacific Ent., vol. 13, p. 75, 1937.

Type.—*Protepeolus singularis* LINSLEY AND MICHENER, 1937. (Monobasic and original designation.)

Proteraner ROBERTSON.

Ent. News, vol. 14, p. 103, 1903.

Type.—*Sphecodes ranunculi* ROBERTSON, 1897. (Monobasic.)

Proterialdes TITUS.

Journ. New York Ent. Soc., vol. 12, p. 25, 1904.

Type.—*Heriades semirubra* COCKERELL, 1898. (Monobasic.)

Protoanthidium CAMERON.

Journ. Straits Branch, Roy. Asiatic Soc., vol. 37, p. 125, 1902. Three species.

Type.—*Protoanthidium rufobalteatum* CAMERON, 1902. (Present designation.)

Synonym of *Dianthidium* COCKERELL, according to Cockerell, Ann. Mag. Nat. Hist., ser. 9, vol. 9, p. 367, 1922.

Protobombus COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, pp. 7 and 9, 1909.

Type.—*Protobombus indecisus* COCKERELL, 1909. (Monobasic and original designation.)

Protodiscelis BRÈTHES.

Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 245, 1909.

Type.—*Protodiscelis flebrigi* BRÈTHES, 1909. (Monobasic.)

Protomelecta COCKERELL [fossil].

Ann. Mag. Nat. Hist., ser. 8, vol. 1, p. 341, 1908.

Type.—*Protomelecta brevipennis* COCKERELL, 1908. (Monobasic.)

Protomelissa FRIESE.

Deutsche Ent. Zeitschr., p. 322, 1914. Two species.

Type.—*Protomelissa iridescent* FRIESE, 1914. (Present designation.)

Protomeliturga DUCKE.

Zool. Jahrb., Abt. Syst., Jena, vol. 34, pp. 63 and 90, 1912.

Type.—*Calliopsis turnerae* DUCKE, 1907. (Monobasic.)

Protosmia DUCKE.

Ber. naturw.-med. Ver., Innsbruck, vol. 25, p. 12, 1900. Ten species.

Type.—*Heriades glutinosus* GIRAUD, 1871. (Present designation.)

Proposed as a subgenus of *Osmia* Panzer.

Protostelis FRIESE.

Die Bienen Europas, vol. 1, p. 25, 1895. Four species.

Type.—*Stelis freydessneri* FRIESE, 1885. (By designation of Popov, Konowia, vol. 17, p. 41, 1938.)

Proposed as a subgenus of *Stelis* Panzer.

Synonym of *Stelis* Panzer, according to Popov, Trav. Inst. Zool. Acad. Sci.

U. R. S. S., vol. 1, p. 379, 1933.

Protoxaea COCKERELL and PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 410, 1899.

Type.—(*Megacilissa*) *Oxaca gloriosa* Fox, 1893. (Monobasic and original designation.)

Proxylcopa HEDICKE.

Deutsche Ent. Zeitschr., p. 192, 1938. Seven species.

Type.—*Xylcopa olivieri* LEPELETIER, 1841. (Original designation.)

Proposed as a subgenus of *Xylcopa* Latreille.

Psaenythia GERSTAECKER.

Arch. Naturg., vol. 34, p. 111, 1868. Ten species.

Type.—*Psaenythia philanthoides* GERSTAECKER, 1868. (Present designation.)

Pseudagapostemon SCHROITKY.

Rev. Mus. La Plata, vol. 16 (ser 2, vol. 3), p. 145, 1909.

Type.—*Agapostemon arenarius* SCHROITKY, 1902. (Monobasic and original designation.)

Pseudapis W. F. KIRBY.

Bull. Liverpool Mus., vol. 3, p. 15, 1900 [reference not seen].

Type.—*Pseudapis anomala* W. F. KIRBY, 1900. (Monobasic.)

Genotype transferred to *Nomia* Latreille by Kohl, Denkschr. Kais. Akad. Wiss., vol. 71, p. 176, 1907.

Synonym of *Nomia* Latreille, according to Meade-Waldo, Ann. Mag. Nat. Hist., ser. 8, vol. 17, p. 454, 1916.

Pseudaugochloropsis SCHROTTKY.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 313, 1906. Two species.

Type.—*Augochloropsis sthena* SCHROTTKY, 1906. (Present designation.)

Halictus nigromarginatus Spinola, 1851, designated by Schrottky, Deutsche Ent. Zeitschr., p. 482, 1909, was not originally included.

Proposed as a subgenus of *Augochloropsis* Cockerell.

Pseudepeolus HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 22, p. 234, 1886.

Type.—*Pseudepeolus fasciatus* HOLMBERG, 1886. (Monobasic.)

Pseudhylaesus COCKERELL.

Mem. Queensland Mus., vol. 9, p. 299, 1929. Two species.

Type.—*Euryglossa albocuneata* COCKERELL, 1913. (Original designation.)

Pseudiscelis FRIESE.

Zeitschr. Syst. Hym. Dipt., vol. 6, p. 228, 1906.

Type.—*Oediscelis* (*Pseudiscelis*) *rostrata* FRIESE, 1906. (Monobasic.)

Proposed as a subgenus of *Oediscelis* Philippi.

Pseudoanthidium FRIESE.

Die Bienen Europas, vol. 4, p. 101, 1898. Five species.

Type.—*Anthidium alpinum* MORAWITZ, 1873. (Present designation.)

Proposed as a subgenus of *Anthidium* Fabricius.

Pseudobranchiata MÉHELY.

Naturgeschichte der Urbienen, pp. 33 and 139, 1935. Two species.

Proposed as a subgenus of *Prosopis* Fabricius but invalid under Article 25c of the International Rules of Zoological Nomenclature, since no genotype was designated.

(**Pseudobranchiata** POPOV) = **Koptogaster** ALFKEN.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 168, 1939.

Type.—*Prosopis bifasciata* JURINE, 1807. (Monobasic and original designation.)

Isogenotypic with *Koptogaster* Alfken.

Pseudobranchiata was first proposed by Méhely, Naturgeschichte der Urbienen, pp. 33 and 139, 1935, as a subgenus of *Prosopis* Fabricius to include two species, but according to Article 25c it has no validity from that date, since no genotype was designated.

Pseudocentron MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 303, 305, 307, and 311, 1934. Eighteen species.

Type.—*Megachile pruina* F. SMITH, 1853. (Original designation.)

Proposed as a subgenus of *Megachile* LATREILLE.

Pseudocilissa RADOSZKOWSKI.

Horae Soc. Ent. Ross., vol. 25, p. 241, 1891.

Type.—*Cilissa robusta* RADOSZKOWSKI, 1876. (Monobasic.)

Synonym of *Melitta* Kirby, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 187, 1896.

(**Pseudocosmia** RADOSZKOWSKI) for **Pseudosmia** RADOSZKOWSKI.

Horae Soc. Ent. Ross., vol. 20, p. 14, 1886.

Pseudodichroa BISCHOFF.

Deutsche Ent. Zeitschr., p. 595, 1923. Two species.

Type.—*Omachtes capensis* FRIESE, 1915. (Present designation.)

Pseudomegachile FRIESE (=Pseudomegalochila SCHULZ).

Term. Fuz., vol. 21, p. 198, 1898. No species.

Die Bienen Europas, vol. 5, p. 36, 1899. Twenty-nine species.

Type.—*Megachile ericetorum* LEPELETIER, 1841. (By designation of Alfken, Konowia, vol. 12, p. 55, 1933.)

Proposed as a subgenus of *Megachile* Latreille.

(Pseudomegalochila SCHULTZ) for Pseudomegachile FRIESE.

Spolia Hymenopterologica, p. 71, 1906.

Pseudomelecta RADOSZKOWSKI.

Horae Soc. Ent. Ross., vol. 3, p. 55, 1865. Two species.

Type.—*Melecta diacantha* EVERSMANN, 1852. (Present designation.)

Synonym of *Melecta* Latreille, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 313, 1896.

(Pseudo-osmia RADOSZKOWSKI) for Pseudosmia RADOSZKOWSKI.

Bull. Soc. Imper. Nat. Moscou, vol. 46, pt. 2, p. 137, 1873; vol. 48, pt. 1, p. 152, 1874.

Pseudopanurgus COCKERELL.

Can. Ent., vol. 29, p. 290, 1897. Two species.

Type.—*Panurgus aethiops* CRESSON, 1872. (Original designation.)

Pseudopasites BISCHOFF.

Deutsche Ent. Zeitschr., p. 593, 1923. Four species.

Type.—*Pasites pygmaeus* FRIESE, 1923. (Present designation.)

Proposed as a subgenus of *Sphecodopsis* Bischoff.

Pseudosmia RADOSZKOWSKI (=Pseudo-osmia, and Pseudocosmia RADOSZKOWSKI).

Horae Soc. Ent. Ross., vol. 8, bull. p. xviii, 1871 (1872). No species.

Bull. Soc. Imper. Nat. Moscou, vol. 48, pt. 1, p. 152, 1874. Nine species.

Type.—*Megachile cristata* FONSCOLOMBE, 1846. (By designation of Cockerell, Amer. Mus. Novit., No. 40, p. 6, 1922.)

Synonym of *Anthocopa* Lepeletier and Serville, according to Cockerell (l. c.).

Psithyrus LEPELETIER (=Apathus NEWMAN).

Ann. Soc. Ent. France, vol. 1, p. 373, 1832. Nineteen species.

Type.—*Apis rupestris* FABRICIUS, 1793. (By designation of Curtis, Brit. Ent., vol. 10, pl. 468, 1833.)

Pterandrena ROBERTSON.

Trans. Amer. Ent. Soc., vol. 28, pp. 187 and 193, 1902. Eight species.

Type.—*Andrena pulchella* ROBERTSON, 1893. (Original designation.)

Ptilandrena ROBERTSON.

Trans. Amer. Ent. Soc., vol. 28, pp. 187 and 192, 1902. Two species.

Type.—*Andrena erigeniae* ROBERTSON, 1891. (Original designation.)

Ptiloglossa F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 7, 1853.

Type.—*Ptiloglossa ducalis* F. SMITH, 1853. (Monobasic.)

Synonym of *Caupolicana* Spinola, according to Vachal, Rev. d'Ent. Franca, p. 34, 1909, and Duche, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 82, 1912.

Ptilopoda FRIESE.

Stettin. Ent. Zeit., vol. 82, p. 83, 1921.

Type.—(*Colletes* (*Ptilopoda*) *maculipennis* FRIESE, 1921) = *Colletes spilopecta* COCKERELL, 1917. (Monobasic.)

Proposed as a subgenus of *Colletes* Latreille.

Ptilothrix F. SMITH (= **Ptilothryx** MARSCHALL; **Energoponus** HOLMBERG).

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 131, 1853.

Type.—*Ptilothrix plumatus* F. SMITH, 1853. (Monobasic.)

Isogenotypic with *Energoponus* Holmberg through synonymy.

(**Ptilothryx** MARSCHALL) for **Ptilothrix** F. SMITH.

Nomenclator Zoologicus, p. 269, 1873.

Ptilotopus KLUG.

Mag. Ges. naturf. Freunde Berlin, vol. 4, p. 31, 1810.

Type.—*Ptilotopus americanorum* KLUG, 1810. (Monobasic.)

As *Ptilotopus* (l. c., p. 45).

Synonym of *Oenitris* Fabricius, according to Latreille, in Cuvier, Règne Animal (new ed.), vol. 5, p. 356, 1829, and Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 302, 1896.

(**Ptoleglossa** FRIESE) = **Orphana** VACHAL.

Stettin. Ent. Zeit., vol. 91, p. 127, 1930.

Type.—(*Leptoglossa paradoxa* FRIESE, 1925) = *Orphana inquirenda* VACHAL, 1909. (Autobasic.)

Proposed for *Leptoglossa* Friese, 1925, not Klug, 1839, which is isogenotypic with *Orphana* Vachal.

Puncticolletes NOSKIEWICZ.

Die palearktischen Colletes-arten, pp. 26 and 490, 1936.

Proposed as a subgenus of *Colletes* Latreille to include three species but without an original genotype designation and therefore invalid under Article 25c.

Pyrobombus DALLA TORRE (= **Pyrrhobombus** DALLA TORRE).

Die Naturhistoriker, vol. 2, p. 40, 1880.

Type.—(*Apis*) *Bombus hypnorum* (LINNAEUS), 1758. (Monobasic.)

Proposed as a subgenus of *Bombus* Latreille.

(**Pyrrhobombus** DALLA TORRE) for **Pyrobombus** DALLA TORRE.

Ber. naturw.-med. Ver., Innsbruck, vol. 12, p. 28, 1832.

Pyrrhomolecta ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 66, 1899.

Type.—*Epeolus glabratus* CRESSON, 1878. (Monobasic and original designation.)

(**Raphidostoma** COCKERELL) = **Chelostomopsis** COCKERELL.

Pan-Pacific Ent., vol. 12, p. 133, 1936.

Type.—(*Raphidostoma ceanothi* COCKERELL, 1936) = (*Chelynia*) *Chelostomopsis rubifloris* (COCKERELL), 1898. (Monobasic and original designation.)

Isogenotypic with *Chelostomopsis* Cockerell through synonymy.

Rediviva FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 30, p. 671, 1911. Three species.

Type.—(*Andrena*) *Rediviva peringueyi* (FRIESE), 1911. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 10, vol. 8, p. 402, 1931.)

Proposed as a subgenus of *Andrena* Fabricius.

Reepenia FRIESE.

Ann. Hist.-Nat. Mus. Hungarici, vol. 7, pp. 191 and 205, 1909.

Type.—*Nomia (Reepenia) variabilis* FRIESE, 1909. (Monobasic.)

Proposed as a subgenus of *Nomia* Latreille.

Rhathymus LEPELETIER AND SERVILLE (= **Colax** LEPELETIER, "inedit," 1825, not HÜBNER, 1819, not WIEDEMANN, 1824; **Liogastra** PERTY).

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 448, 1823.

Type.—*Rhathymus bicolor* LEPELETIER AND SERVILLE, 1828. (Monobasic.)

[No species was included in *Colax*.]

Isogenotypic with *Liogastra* Perty through synonymy.

(Rhineta KLUG) = Biastes PANZER.

Magazin für Insektenkunde, vol. 6, p. 198, 1807.

Type.—(*Nomada schottii* FABRICIUS, 1804) = *Tiphia brevicornis* PANZER, 1798.
(Monobasic.)

Isogenotypic with *Biastes* Panzer through synonymy.

Rhinetula FRIESE.

Zool. Jahrb., Abt. Syst., Jena, vol. 45, p. 581, 1922. Six species.

Type.—*Rhinetula denticrus* FRIESE, 1922. (Present designation.)

Rhinochaetula FRIESE.

Arch. Naturg., Jahrg. 78, Abt. A, Heft 5, p. 185, 1912. Three species.

Type.—*Capicola* (*Rhinochaetula*) *cinctiventris* FRIESE, 1912. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 8, vol. 15, p. 343, 1915.)

Proposed as a subgenus of *Capicola* Friese.

Rhinocolletes COCKERELL.

Entomologist, vol. 43, p. 242, 1910.

Type.—*Colletes nasutus* F. SMITH, 1853. (Monobasic.)

Proposed as a subgenus of *Colletes* Latreille.

Rhinocorynura SCHROTTKY.

Rev. Mus. La Plata, vol. 16 (ser. 2, vol. 3), p. 147, 1909.

Type.—"*Halictus* (*Corynura* vel *Corynuropsis*) *inflaticeps*" DUCKE, 1907.
(Monobasic and original designation.)

Rhodanthidium ISENSEE.

Ann. Carnegie Mus., vol. 17, pp. 372 and 374, 1927.

Type.—*Anthidium siculum* SPINOLA, 1838. (Monobasic and original designation.)

Proposed as a subgenus of *Dianthidium* Cockerell.

Rhodobombus DALLA TORRE (=Pomobombus KRÜGER).

Die Naturhistoriker, vol. 2, p. 40, 1880. Three species.

Type.—(*Bremus*) *Bombus pomorum* (PANZER), 1804. (Present designation.)

Proposed as a subgenus of *Bombus* LATREILLE.

Isogenotypic with *Pomobombus* KRÜGER.

(Rhodocentris FRIESE) = Heterocentris COCKERELL.

Ann. Nat. Hofmus. Wien, vol. 15, p. 242, 1900. Thirty-seven species.

Type.—(*Centris cornuta* CRESSON, 1865) = *Centris difformis* F. SMITH, 1854.
(Present designation.)

Proposed as a subgenus of *Centris* Fabricius.

Isogenotypic with *Heterocentris* Cockerell.

Rhopalictus SICHEL.

Novara Expedition, Zoologischer Theil, vol. 2, Hymenoptera, Fossoria et Mellifera, Suppl., p. 146, 1807. Three species.

Type.—*Halictus* (*Corynura*) *flavofasciatus* SPINOLA, 1851. (Present designation.)

Synonym of *Corynura* Spinola, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 92, 1896.

Rhopalomelissa ALFKEN.

Treubia, vol. 7, p. 267, 1926. Three species.

Type.—*Rhopalomelissa xanthogaster* ALFKEN, 1926. (Present designation.)

(Rhopites DALLA TORRE) for Rophites SPINOLA.

Catalogus hymenopterorum, vol. 10, p. 175, 1896.

Rhophitoides SCHENCK.

Jahrb. Ver. Naturk. Herzogthum Nassau, Heft 14, pp. 29, 69, 171 and 207, 1859. Two species.

Type.—(*Rhophitoides distinguendus* SCHENCK, 1859) = *Rhophites canus* Eversmann, 1852. (Monobasic.)

Synonym of *Rophites* Spinola, according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 175, 1896.

Rhophitulus DUCKE.

Zeitschr. Syst. Hym. Dipt., vol. 7, p. 366, 1907. Two species.

Type.—*Rhophitulus friesi* [*friesci*] DUCKE, 1907. (Present designation.)

Rivalisia STRAND.

Arch. Naturg., Jahrg. 87, Abt. A, Heft 3, p. 270, 1921.

Type.—*Rivalisia metallica* STRAND, 1921. (Monobasic.)

Probably is *Augochlora* F. SMITH, according to Blüthgen, Deutsche Ent. Zeitschr., p. 72, 1923.

Robertsonella TITUS.

Journ. New York Ent. Soc., vol. 12, p. 22, 1904.

Type.—(*Robertsonella gleasoni* TITUS, 1904) = (*Heriades*) *Robertsonella simplex* (CRESSON), 1864. (Monobasic and original designation.)

Robustobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 157, 1922. Five species.

Type.—(*Bombus*) *Alpigenobombus* (*Robustobombus*) *robustus* (F. SMITH), 1854. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Alpigenobombus* Skorikov.

Rophites SPINOLA (= *Rhophites* DALLA TORRE).

Insectorum Liguriae species novae et rariores . . . , vol. 2, pp. 8 and 72, 1808.

Type.—*Rophites quinquespinosa* SPINOLA, 1808. (Monobasic.)

Rostratilapis FRIESE.

Tijd. Ent., vol. 57, p. 26, 1914. Two species.

Type.—*Halictus* (*Rostratilapis*) *macrognathus* FRIESE, 1914. (Present designation.)

Proposed as a subgenus of *Halictus* Latreille.

Rubicundobombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 154, 1922. Two species.

Type.—(*Bombus*) *Fervidobombus* (*Rubicundobombus*) *rubicundus* (F. SMITH), 1854. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Fervidobombus* Skorikov.

Rufipedibombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 156, 1922.

Type.—(*Bombus*) *Rufipedibombus rufipes* (LEPELETIER), 1836. (Monobasic.)

Sabulicola VERHOEFF.

Ent. Nachr., vol. 16, pp. 328 and 386, 1890.

Type.—*Sabulicola cirsti* VERHOEFF, 1890. (Monobasic.)

Synonym of *Sphecodes* Latreille, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 1, 1896.

Samba FRIESE.

Deutsche Ent. Zeitschr., p. 568, 1908.

Type.—*Samba calcarata* FRIESE, 1908. (Monobasic.)

Sarogaster ROBERTSON (=Gnathodon ROBERTSON, 1903, not OKEN, 1816, not SOWERBY, 1832, not STREUBEL, 1842, not JARDINE, 1845).

Ent. News, vol. 29, p. 92, 1918.

Type.—*Megachile georgica* CRESSON, 1878. (Autobasic.)

Synonym of *Ohelostomoides* Robertson, according to Mitchell, Trans. Amer.

Ent. Soc., vol. 59, p. 298, 1934.

(**Saropoda** LATREILLE) = **Heliophila** KLUG.

Genera crustaceorum et insectorum . . . , vol. 4, p. 177, 1809.

Type.—*Apis bimaculata* PANZER, 1798. (Autobasic.)

Proposed unnecessarily for *Heliophila* Klug, 1807, not *Heliophilus* Meigen, 1803.

Sarotes KLUG, nomen nudum.

Magazine für Insektenkunde, vol. 6, p. 196, 1807.

Sayapis TITUS (=Gnathocera PROVANCHER, 1882, not KIRBY, 1825; Ceratias ROBERTSON, 1903, not KROYER, 1845).

Proc. Ent. Soc. Washington, vol. 7, p. 154, 1905.

Type.—*Megachile pugnatus* SAY, 1837. (Autobasic.)

Scaura SCHWARZ.

Bull. Amer. Mus. Nat. Hist., vol. 74, p. 479, 1933.

Type.—*Trigona latitarsis* FRIESE, 1900. (Monobasic and original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Schizandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 218, 1933. Four species.

Type.—*Andrena aulica* MORAWITZ, 1876. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Schmiedeknechtia FRIESE.

Term. Fuz., vol. 19, p. 277, 1896.

Type.—*Schmiedeknechtia oraniensis* FRIESE, 1896. (Monobasic.)

Schönherria LEPELETIER.

Histoire naturelle des insectes. Hyménoptères, vol. 2, p. 207, 1841. Six species.

Type.—*Xyllocopa (Schönherria) micans* LEPELETIER, 1841. (Present designation.)

Proposed as a subgenus of *Xyllocopa* Latreille.

Synonym of *Xyllocopa* Latreille according to Dalla Torre, Catalogus hymenopterorum, vol. 10, p. 202, 1896, and Ashmead, Trans. Amer. Ent. Soc., vol. 26, p. 71, 1899.

(**Schrottkeya** FRIESE) = **Lanthanomelissa** HOLMBERG.

Zeitschr. Syst. Hym. Dipt., vol. 8, p. 170, 1908. No species.

Flora og Fauna Aarbog, vol. 10, p. 58, 1908. One species.

Type.—*Tetrapedia goeldiana* FRIESE, 1899. (First species included.)

Proposed as a subgenus of *Tetrapedia* Klug.

Isogenotypic with *Lanthanomelissa* Holmberg through synonymy.

Synonym of *Anthophorula* Cockerell, according to Schrottkey, Deutsche Ent. Zeitschr., p. 795, 1909.

(**Scirtetica** HOLMBERG, not SAUSSURE, 1884) = **Alloscirtetica** HOLMBERG.

Anal. Mus. Buenos Aires, ser. 3, vol. 2, p. 389, 1903.

Type.—*Scirtetica antarctica* HOLMBERG, 1903. (Monobasic.)

Scapter LEPELETIER AND SERVILLE.

Encycl. Méthod., Hist. Nat. Ins., vol. 10, p. 403, 1828. Four species.

Type.—*Scapter bicolor* LEPELETIER AND SERVILLE, 1828. (By designation of Vachal, Bull. Soc. Ent. France, p. 63, 1897.) *Scapter brullei* Lepeletier, 1841, designated by Ashmead, Trans. Amer. Ent. Soc., vol. 28, p. 84, 1899, was not originally included. (*Andrena*) *Scapter lagopus* (Latreille), 1809, designated by Cockerell, Ann. Durban Mus., vol. 2, p. 254, 1930.

Synonym of *Macropis* Panzer, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 193, 1896.

Scapteroides GRIBODO.

Bull. Soc. Ent. Italiana, vol. 26, p. 112, 1894.

Type.—(*Scapteroides difformis* GRIBODO 1894) = (*Andrena*?) *Panurginus albopilosus* (Lucas), 1846. (Monobasic.)

Synonym of *Panurginus* Nylander, according to Cockerell, Trans. Amer. Ent. Soc., vol. 29, p. 187, 1903.

Scapteropsis VIERECK.

Occas. Papers Boston Soc. Nat. Hist., vol. 5, p. 42, 1922.

Type.—*Andrena (Scapteropsis) fenningeri* VIERECK, 1922. (Monobasic.)

Proposed as a subgenus of *Andrena* Fabricius.

Seladonia ROBERTSON.

Ent. News, vol. 29, p. 91, 1918. Three species.

Type.—(*Apis*) *Halictus seladonius* (FABRICIUS), 1794. (Original designation.)

Senexibombus FRISON.

Treubia, vol. 12, p. 3, 1930. Two species.

Type.—*Bombus senex* VOLLENHOVEN, 1873. (Original designation.)

Proposed as a subgenus of *Bremus* Jurine.

Separatobombus FRISON.

Trans. Amer. Ent. Soc., vol. 53, p. 64, 1927. Two species.

Type.—((*Bombus*) *Bremus separatus* (CRESSON), 1863) = *Apis griseocollis* Degeer, 1773. (Original designation.)

Proposed as a subgenus of *Bremus* Jurine.

(Serapis F. SMITH, not LINK, 1830) = **Serapista** COCKERELL.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 218, 1854.

Type.—*Serapis denticulatus* F. SMITH, 1854. (Monobasic.)

Serapista COCKERELL (=Serapis F. SMITH, 1854, not LINK, 1830.)

Can. Ent., vol. 36, p. 357, 1904.

Type.—*Serapis denticulatus* F. SMITH, 1854. (Autobasic.)

Sibiricobombus VOGT.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 60, 1911. Six species.

Type.—(*Apis*) *Bombus sibiricus* (FABRICIUS), 1781. (Present designation because of virtual tautonymy.)

Proposed as a subgenus of *Bombus* Latreille.

Simandrena PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 44, p. 174, 1890. Many species.

Type.—*Andrena propinqua* SCHENCK, 1853. (By designation of Hedicke, Mitt. Zool. Mus. Berlin, vol. 19, p. 218, 1933.)

Proposed as a subgenus of *Andrena* Fabricius.

(*Smithia* VACHAL, not MILNE-EDWARDS, 1851, not SAUSSURE, 1855, not MABILIE, 1880, not MALTZAN, 1883, not MONTEROSATO, 1884) = *Melittosmithia* SCHULZ.

Bull. Soc. Ent. France, p. 63, 1897. No species.

Cockerell, Ann. Mag. Nat. Hist., ser. 8, vol. 6, p. 358, 1910. Two species.

Type.—*Scapter carinata* F. SMITH, 1862. (By designation of Cockerell (l. c.).)

Solenopalpa PÉREZ.

Actes Soc. Linn. Bordeaux, vol. 52, p. lxxvii, 1897.

Type.—*Solenopalpa fertoni* Pérez, 1897. (Monobasic.)

Sophrobombus COCKERELL [fossil].

Schrift. phys.-ökon. Ges. Königsberg, Jahrg. 50, p. 21, 1909.

Type.—*Sophrobombus fatalis* COCKERELL, 1909. (Monobasic.)

(*Soroceansibombus* VOGT) = *Kallobombus* DALLA TORRE.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 63, 1911.

Type.—(*Apis*) *Bombus soroensis* (FABRICIUS), 1776. (Monobasic.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Kallobombus* Dalla Torre.

(*Spatularia* MÉHELY), not VAN DEVENTER, 1904.

Naturgeschichte der Urbienen, pp. 69 and 175, 1935. Two species.

Proposed as a subgenus of *Prosopis* FABRICIUS, but invalid under Article 25c of the International Rules of Zoological Nomenclature, since no genotype was designated.

Spatulariella POPOV.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser. vol. 25, p. 169, 1939.

Proposed as a subgenus of *Prosopis* Fabricius to replace *Spatularia* Méhely, 1935 (not van Deventer, 1904) which is invalid.

Type—(*Hylaeus*) *Prosopis hyalinata* (F. SMITH), 1842. (Monobasic and original designation.)

Spatularia was proposed by Méhely, Naturgeschichte der Urbienen, pp. 69 and 175, 1935, as a subgenus of *Prosopis* Fabricius to include two species, but under Article 25c it has no validity from that date, since no genotype was designated.

Sphaerhylaesus COCKERELL.

Rec. Australian Mus., vol. 17, p. 217, 1929.

Type.—*Gnathoprosopis* (*Sphaerhylaesus*) *globulifera* COCKERELL, 1929. (Monobasic.)

Proposed as a subgenus of *Gnathoprosopis* Perkins.

Sphecodes LATREILLE (= *Dichroa* ILLIGER).

Nouv. Dict. Hist. Nat., vol. 24, p. 182, 1804.

Type.—(*Nomada gibba* FABRICIUS, 1804) = *Spheæ gibba* LINNAEUS, 1758. (Monobasic.)

Isogenotypic with *Dichroa* Illiger.

Sphecodium ROBERTSON.

Ent. News, vol. 14, p. 104, 1903. Four species.

Type.—*Sphecodium cressonii* ROBERTSON, 1903. (Original designation.)

Sphecodogastra ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 92, 1899.

Type.—(*Sphecodes*) *Parasphecodes texana* (CRESSON), 1872. (Monobasic and original designation.)

Sphecodopsis BISCHOFF.

Deutsche Ent. Zeitschr., p. 593, 1923. Two species.

Type.—*Omachtes capitola* STRAND, 1911. (Original designation.)

Sphecodosoma CRAWFORD.

Journ. New York Ent. Soc., vol. 15, p. 182, 1907.

Type.—*Sphecodosoma pratti* CRAWFORD, 1907. (Monobasic and original designation.)

(Sphegocephala ASHMEAD) for Sphegocephala SAUSSURE.

Trans. Amer. Ent. Soc., vol. 26, p. 89, 1899.

Sphegocephala SAUSSURE (=Sphegocephala ASHMEAD).

In Grandidier, Hist. Nat. Madagascar, vol. 20, Hymen., pt. 1, p. 74, 1890.

Type.—*Sphegocephala philanthoides* SAUSSURE, 1890. (Monobasic.)

Spinoliella ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 84, 1899.

Type.—(*Camptopocum nomioides* [sic!] SPINOLA) = *Camptopocum nomadoides* SPINOLA, 1851. (Monobasic and original designation.)

Steganomus RITSEMA.

Tijd. Ent., vol. 16 (ser. 2, vol. 8), pp. 63 and 224, 1873.

Type.—*Steganomus javanus* RITSEMA, 1873. (Monobasic.)

Stelidium ROBERTSON.

Can. Ent., vol. 24, p. 323, 1902.

Type.—*Stelidium trypetinum* ROBERTSON, 1902. (Monobasic and original designation.)

Stelidomorpha MORAWITZ.

Imp. Obshch. . . Moskva, vol. 19, p. 131, 1875.

Type.—*Anthidium nasutum* LATREILLE, 1809. (Monobasic.)

Stelis PANZER (=Gyrodroma KLUG; Gymnus SPINOLA; Ceraplastes GISTEL.)

Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 246, 1806.

Type.—(*Apis aterrima* PANZER, 1798, not CHRIST, 1791) = *Apis punctulatissima* KIRBY, 1802. (Monobasic.)

Isogenotypic with *Gyrodroma* Klug, *Gymnus* Spinola, and *Ceraplastes* Gistel. *Trachusa* Jurine, 1801, also isogenotypic with *Stelis*, has been invalidated by Opinion 135 of the International Commission of Zoological Nomenclature.

Stellenigris MEUNIER.

Naturalista Siciliano, vol. 7, p. 152, 1888.

Type.—*Stellenigris vandeveldeii* MEUNIER, 1888. (Monobasic.)

Stenocolletes SCHROTTKY.

Anal. Soc. Cient. Argentina, vol. 68, p. 253, 1909.

Type.—*Stenocolletes pictus* SCHROTTKY, 1909. (Monobasic and original designation.)

Stenosmia MICHENER.

Amer. Midland Nat., vol. 26, p. 165, 1941.

Type.—*Osmia flavicornis* MORAWITZ, 1878. (Monobasic and original designation.)

Stenotritus F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 119, 1853.

Type.—*Stenotritus elegans* F. SMITH, 1853. (Monobasic.)

Stictonomia CAMERON.

Rec. Albany Mus., vol. 1, p. 192, 1905.

Type.—*Stictonomia punctata* CAMERON, 1905. (Monobasic.)

Stilpnosoma F. SMITH.

Descriptions of new species of Hymenoptera . . . British Museum, p. 16, 1879.

Type.—*Stilpnosoma laevigatum* F. SMITH, 1879. (Monobasic.)

Strandiella FRIESE.

Arch. Naturg., Jahrg. 78, Abt. A, Heft 5, p. 18, 1912. Six species.

Type.—*Strandiella longula* FRIESE, 1912. (By designation of Cockerell, Ann. Mag. Nat. Hist., ser. 8, vol. 17, p. 430, 1916.)

Synonym of *Scapter* LEPELETIER AND SERVILE, according to Cockerell, Entomologist, vol. 65, p. 10, 1932.

Subterraneobombus Vogt.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 62, 1911. Three species.

Type.—(*Apis*) *Bremus subterraneus* (LINNAEUS), 1758. (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 68, 1927.)

Proposed as a subgenus of *Bombus* Latreille.

Sudila CAMERON (=Ceylonicola FRIESE).

Mem. Proc. Manchester Lit. Philos. Soc., vol. 42, p. 52, 1898. Three species.

Type.—*Sudila bidentata* CAMERON, 1898. (Present designation.)

Isogenotypic with *Ceylonicola* Friese through synonymy.

(Sulcobombus Knüger) = Confusibombus BALL.

Ent. Mitt., vol. 6, p. 65, 1917. Two species.

Type.—*Bombus confusus* SCHENCK, 1859. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Confusibombus* Ball.

Svastra HOLMBERG.

Actas Acad. Nac. Cienc. Córdoba, vol. 5, p. 127, 1884. Two species.

Type.—*Svastra bombilans* HOLMBERG, 1884. (Present designation.)

(Symmorpha KLUG) = Melecta LATREILLE.

Magazin für Insektenkunde, vol. 6, pp. 198 and 227, 1807.

Type.—(*Apis*) *Centris punctata* (FABRICIUS), 1775. (Monobasic.)

Isogenotypic with *Melecta* Latreille.

Synapsis COCKERELL [fossil].

Entomologist, vol. 40, p. 229, 1907.

Type.—*Apis* (*Synapsis*) *henshawi* COCKERELL, 1907. (Monobasic.)

Proposed as a subgenus of *Apis* Linnaeus.

Synepeolus COCKERELL.

Amer. Mus. Novitates, no. 23, p. 6, 1921.

Type.—*Triepeolus* (*Synepeolus*) *insolitus* COCKERELL, 1921. (Monobasic.)

Proposed as a subgenus of *Triepeolus* Robertson.

Synhalonia PATTON.

Bull. U. S. Geol. Surv. Terr., vol. 5, p. 473, 1879. Eight species.

Type.—*Melissodes fulvitaris* CRESSON, 1878. (Original designation.)

Synonym of *Tetralonia* Spinola, according to Ducke, Zool. Jahrb., Abt.

Syst., Jena, vol. 34, p. 96, 1912; and Lutz and Cockerell, Bull. Amer. Mus.

Nat. Hist., vol. 42, p. 615, 1920.

Systrophia ILLIGER.

Magazin für Insektenkunde, vol. 5, p. 145, 1805 [1806].

Type.—(*Andrena* *spiralis* OLIVIER, 1789) = *Eucera curvicornis* SCOPOLI, 1779. (Monobasic)

Systrophidia COCKERELL

Ann. Mag. Nat. Hist., ser. 10, vol. 17, p. 477, 1936.

Type.—*Systrophia* (*Systrophidia*) *ogilviei* COCKERELL, 1936. (Monobasic.)

Proposed as a subgenus of *Systrophia* Illiger.

Taeniandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 219, 1933. Twenty-two species.

Type.—(*Melitta*) *Andrena ovatula* (KIRBY), 1802. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Tanguticobombus PITTONI.

Zool. Anz., vol. 126, p. 201, 1939.

Type.—*Bombus tanguticus* MORAWITZ, 1886. (Monobasic and original designation.)

Proposed as a subgenus of *Bombus* Latreille.

(Tapinotapsis HOLMBERG, nomen nudum)=**Tapinotaspis** HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887.

Tapinotaspis HOLMBERG (=Tapinotapsis HOLMBERG, nomen nudum).

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 413, 1903. Two species.

Type.—*Tapinotaspis chacabucensis* HOLMBERG, 1903. (Present designation.)

Tarsalia MORAWITZ.

Horae Soc. Ent. Ross., vol. 29, p. 9, 1895.

Type.—*Tarsalia hirtipes* MORAWITZ, 1895. (Monobasic.)

Teleutemnesta HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887. No species.

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 400, 1903. Five species.

Type.—*Teleutemnesta fructifera* HOLMBERG, 1903. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 44, p. 36, 1918.)

Synonym of *Ancyloscelis* HALIDAY, according to Brèthes, Anal. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 223, 1909.

Temnosoma F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 1, p. 38, 1853.

Type.—*Temnosoma metallicum* F. SMITH, 1853. (Monobasic.)

(Terrestribombus VOGT)=**Bombus** LATREILLE, 1801.

Sitz.-Ber. Ges. naturf. Freunde Berlin, p. 55, 1811. Two species.

Type.—(*Apis*) *Bremus terrestris* (LINNAEUS) 1758 (By designation of Frison, Trans. Amer. Ent. Soc., vol. 53, p. 67, 1927.)

Proposed as a subgenus of *Bombus* Latreille.

Isogenotypic with *Bombus* Latreille and *Leucobombus* Dalla Torre.

Tetrachlora SCHROTTKY.

Deutsche Ent. Zeitschr., p. 481, 1909.

Type.—(*Halictus*) *Augochlora* (*Tetrachlora*) *multiplex* (VACHAL), 1903. (Monobasic.)

Proposed as a subgenus of *Augochlora* F. Smith.

Synonym of *Augochloropsis* Cockerell, according to Schrottky, Deutsche Ent. Zeitschr., p. 540, 1910.

Tetragona LEPELETIER AND SERVILLE.

Encycl. Méthod., Hist. Nat., Ins., vol. 10, p. 710, 1828. Two species.

Type.—(*Trigona* (*Tetragona*) *elongata* LEPELETIER AND SERVILLE, 1828)=*Centris clavipes* Fabricius, 1804. (Original designation.)

Proposed as a subgenus of *Trigona* Jurine.

Tetralonia SPINOLA (=Macrocera LATREILLE, 1810, not MEIGEN, 1803).

Ann. Soc. Ent. France, vol. 7, p. 538, 1838.

Type.—(*Eucera antennata* PANZER, 1806=*Eucera antennata* FABRICIUS, 1793)=*Apis malvae* ROSSI, 1790. (Autobasic.) *Tetralonia basizona* Spinola, 1838, designated by Lutz and Cockerell, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 615, 1930, was not originally included in *Macrocera* Latreille.

Tetraloniella ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 61, 1899.

Type.—(*Macrocera*) *Tetraloniella graga* [*grata*] (EVERSMANN), 1852. (Monobasic and original designation.)

(*Tetrapaedia* DALLA TORRE) for *Tetrapedia* KLUG.

Catalogus hymenopterorum, vol. 10, p. 299, 1896.

Tetrapedia KLUG (= *Tetrapedium* BERTHOLD; *Tetrapaedia* DALLA TORRE).

Mag. Ges. naturf. Freunde Berlin, vol. 4, p. 33, 1810.

Type.—*Tetrapedia diversipes* KLUG, 1810. (Monobasic.)

(*Tetrapedium* BERTHOLD) for *Tetrapedia* KLUG.

Latreille's natürliche Familien des Tierreichs, p. 468, 1827.

Tetraperdita COCKERELL AND PORTER.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 414, 1899.

Type.—*Perdita sermaculata* COCKERELL, 1895. (Monobasic and original designation.)

Proposed as a subgenus of *Perdita* F. Smith.

Thalestria F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 283, 1854.

Type.—*Thalestria smaragdina* F. SMITH, 1854. (Monobasic.)

Thaumatosoma F. SMITH.

Trans. Ent. Soc. London, ser. 3, vol. 2, p. 394, 1865.

Type.—*Thaumatosoma duboulaii* F. SMITH, 1865. (Monobasic.)

Thoracobombus DALLA TORRE.

Die Naturhistoriker, vol. 2, p. 40, 1880. Five species.

Type.—*Apis sylvarum* LINNAEUS, 1761. (Present designation.)

Proposed as a subgenus of *Bombus* Latreille.

Thrausmus BUYSSON.

Ann. Soc. Ent. France, vol. 69, p. 177, 1900.

Type.—*Thrausmus grandidieri* BUYSSON, 1900. (Monobasic.)

Thrinchostoma SAUSSURE (= *Trichostoma*, *Thrincoctoma* DALLA TORRE; *Trinchoctoma* SLADEN).

In Grandidler, Hist. Nat. Madagascar, vol. 20, Hymen., pt. 1, p. 52, 1890.

Type.—*Thrinchostoma rentantely* SAUSSURE, 1890. (Monobasic.)

(*Thrincoctoma* DALLA TORRE) for *Thrinchostoma* SAUSSURE.

Catalogus Hymenopterorum, vol. 10, p. 641, 1896.

Thygater HOLMBERG.

Actas Acad. Nac. Cienc. Córdoba, vol. 5, p. 133, 1884.

Type.—*Tetralonia terminata* F. SMITH, 1854. (Monobasic.)

Thygatina COCKERELL.

Trans. Amer. Ent. Soc., vol. 37, p. 237, 1911.

Type.—*Thygatina fumida* COCKERELL, 1911. (Monobasic.)

Thyreothremma HOLMBERG (= *Thyreotremata* HOLMBERG, nomen nudum).

Anal. Mus. Nac. Buenos Aires, ser. 3, vol. 2, p. 291, 1903. Three species.

Type.—*Thyreothremma rhopalocera* HOLMBERG, 1903. (Present designation.)

Thyreotremata HOLMBERG, (nomen nudum) = *Thyreothremma* HOLMBERG.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 225, 1887.

Thyreus PANZER (= *Crocisa* JURINE, 1801; *Crocissa* PANZER, 1806).

Kritische Revision der Insektenfauna Deutschlands . . . , vol. 2, p. 263, 1806.

Type.—*Nomada scutellaris* FABRICIUS, 1781. (Monobasic.)

Isogenotypic with *Crocissa* Panzer.

As a result of the suppression of the "Erlangen List" *Thyreus* Panzer replaces *Crocisa* Jurine, 1801, as Panzer (1806) synonymized *Crocissa* Panzer with *Thyreus*. Dalla Torre's procedure of placing *Thyreus* Panzer, 1806, as a synonym of *Crocisa* Jurine, 1807, Catalogus Hymenopterorum, vol. 10, p. 319, 1896, cannot be followed.

Titusella COCKERELL.

Bull. Amer. Mus. Nat. Hist., vol. 22, p. 445, 1906.

Type.—*Titusella prinitens* COCKERELL, 1906. (Monobasic.)

Toba HOLMBERG, nomen nudum.

Bol. Acad. Nac. Cienc. Córdoba, vol. 10, p. 226, 1887.

Townsendiella CRAWFORD.

Insecutor Inscitiae Menstruus, vol. 4, pp. 136 and 138, 1916.

Type.—*Townsendiella pulchra* CRAWFORD, 1916. (Monobasic.)

Trachandrena ROBERTSON.

Trans. Amer. Ent. Soc., vol. 28, pp. 187 and 189, 1902. Eleven species.

Type.—*Andrena rugosa* ROBERTSON, 1891. (Original designation.)

Trachina KLUG.

Magazin für Insektenkunde, vol. 6, p. 226, 1807. Three species.

Type.—*Centris longimana* FABRICIUS, 1804. (By designation of Cockerell, Trans. Amer. Ent. Soc., vol. 32, p. 105, 1906.)

Synonym of *Centris* Fabricius, according to Dalla Torre, Catalogus Hymenopterorum, vol. 10, p. 302, 1896.

(**Trachusa** JURINE) = **Stelis** PANZER.

Erlangen Litteratur-Zeitung, vol. 1, p. 164, 1801. Seven species.

Type.—(*Apis aterrima* PANZER, 1798, not CHRIST, 1791) = *Apis punctulatisima* KIRBY, 1802. (By designation of Morice and Durrant, Trans. Ent. Soc. London, p. 426, 1915.)

Isogenotypic with *Stelis* Panzer, *Gyrodroma* Klug, *Gymnus* Spinola, and *Ceraplastes* Gistel.

Invalid under Opinion 135 of the International Commission on Zoological Nomenclature.

Trachusa PANZER (= **Diphysis** LEPELETIER).

Faunae insectorum Germaniae initia, vol. 8, Heft. 86, expl. pl. 14–15, 1804. Two species.

Type.—(*Trachusa serratulae* PANZER, 1804) = *Apis byssina* PANZER, 1798. (By present designation.) "Rigidly construed" neither Schenck, Jahrb. Ver. Naturk. Herzogthum Nassau, vol. 16, p. 187, 1861; Jahrb. Nassau. Ver. Naturk., vol. 21–22, p. 325, 1867–68 [1870], nor Morice and Durrant, Trans. Ent. Soc. London, p. 427, 1915, designate *serratulae* as type of *Trachusa* Panzer.

Isogenotypic with *Diphysis* Lepeletier through synonymy.

Trichanthidium COCKERELL.

Rev. Zool. Bot. Africae, vol. 19, p. 52, 1930.

Type.—*Pachyanthidium* (*Trichanthidium*) *occipitale* COCKERELL, 1930. (Monobasic.)

Proposed as a subgenus of *Pachyanthidium* Friese.

Trichocerapis COCKERELL.

Ent. News, vol. 15, p. 292, 1904.

Type.—*Tetralonia mirabilis* F. SMITH, 1865. (Monobasic and original designation.)

Trichocolletes COCKERELL.

Entomologist, vol. 45, p. 176, 1912.

Type.—*Lamprocolletes venustus* F. SMITH, 1862. (Monobasic and original designation.)

(**Trichostoma** DALLA TORRE) for **Thrinchostoma** SAUSSURE.

Catalogus hymenopterorum, vol. 10, p. 381, 1896.

Trichota MÉHELY.

Naturgeschichte der Urbielen, pp. 63 and 169, 1935. Two species.

Proposed as a subgenus of *Prosopis* Fabricius, but invalid under Article 250 of the International Rules of Zoological Nomenclature, since no type was designated.

(Trichota Popov) = Hylaeus FABRICIUS.

Compt. Rend. (Doklady) Acad. Sci. U. R. S. S., new ser., vol. 25, p. 169, 1939.

Type.—(*Apis*) *Prosopis annulata* (LINNAEUS), 1758. (Monobasic and original designation.)

Proposed as a subgenus of *Prosopis* FABRICIUS.

Isogenotypic with *Hylaeus* Fabricius and *Pectinata* Popov.

Trichota was first proposed by Méhely, Naturgeschichte der Urbienen, pp. 63 and 169, 1935, as a subgenus of *Prosopis* Fabricius to include two species but, under Article 25c (amendment), it has no validity from that date, since no genotype was designated.

Tricornibombus SKORIKOV.

Bull. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 151, 1922.

Type.—(*Bombus*) *Agrobombus* (*Tricornibombus*) *tricornis* RADOSZKOWSKI, 1888. (Monobasic.)

Proposed as a subgenus of *Agrobombus* Vogt.

Tridentosmia SCHMIEDEKNECHT.

Apidae Europaeae, vol. 2, p. 21 [1887], 1884–86 [1885]. Six species.

Type.—*Osmia tridentata* DUFOUR AND PERRIS, 1840. (By designation of Michener, Amer. Midland Nat., vol. 26, p. 159, 1941.)

Proposed as a subgenus of *Osmia* Panzer.

Triepeolus ROBERTSON.

Can. Ent., vol. 33, p. 231, 1901. Nine species.

Type.—*Epeolus concavus* CRESSON, 1878. (Original designation.)

Trigona JURINE (= Amalthea RAFINESQUE).

Nouvelle méthode de classer les hyménoptères et les diptères, vol. 1, p. 245, 1807. Three species.

Type.—(*Apis amalthea* FABRICIUS, 1793) = *Apis amalthea* OLIVIER, 1789. (By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.) *Trigona orbignyi* Guérin, 1845, designated by Girard, Traité élémentaire d'entomologie, vol. 2, p. 725, 1879, was not originally included.

Trilia VACHAL.

Ann. Soc. Ent. France, vol. 68, p. 534, 1899.

Type.—*Dufourea* (*Trilia*) *muoti* VACHAL, 1899. (Monobasic.)

Proposed as a subgenus of *Dufourea* Lepeletier.

(Trinchostoma SLADEN) for Thrinchostoma SAUSSURE.

Can. Ent., vol. 44, p. 214, 1915.

Triopasites LINSLEY.

Pan-Pacific Ent., vol. 15, p. 8, 1939.

Type.—*Triopasites timberlakei* LINSLEY, 1939. (Monobasic and original designation.)

Tropandrena VIERECK.

Can. Ent., vol. 56, p. 21, 1924.

Type.—*Andrena fragilis* F. SMITH, 1853. (Monobasic and original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Synonym of *Gonandrena* Viereck, according to Cockerell (Can. Ent., vol. 64, p. 157, 1932).

Trophocleptria HOLMBERG.

Anal. Soc. Cient. Argentina, vol. 22, p. 275, 1886.

Type.—*Trophocleptria variolosa* HOLMBERG, 1886. (Monobasic.)

Synonym of *Epeolus* Latreille, according to Brèthes, Ann. Mus. Nac. Buenos Aires, vol. 19 (ser. 3, vol. 12), p. 68, 1909; and Ducke, Zool. Jahrb., Abt. Syst., Jena, vol. 34, p. 99, 1912.

(*Trypetes* SCHENCK, not SCHÖNHERR, 1836) = *Heriades* SPINOLA.

Jahrb. Ver. Naturk. Herzogthum Nassau, vol. 14, pp. 32 and 89, 1859.

Type.—(*Apis*) *Heriades truncorum* (LINNAEUS), 1758. (Monobasic.)

Isogenotypic with *Heriades* Spinola.

Trypetes Schenck is preoccupied, but since it falls as a synonym of *Heriades* Spinola no name is proposed to replace it.

Turnerella COCKERELL.

Entomologist, vol. 43, p. 262, 1910.

Type.—*Turnerella gilberti* COCKERELL, 1910. (Monobasic.)

Verbenapis COCKERELL AND ATKINS.

Ann. Mag. Nat. Hist., ser. 7, vol. 10, p. 44, 1902.

Type.—*Calliopsis verbenae* COCKERELL AND PORTER, 1899. (Monobasic.)

Proposed as a subgenus of *Calliopsis* F. Smith.

Viereckella SWENK.

Ent. News, vol. 18, p. 298, 1907. Two species.

Type.—*Viereckella obscura* SWENK, 1907. (Original designation.)

Synonym of *Epcoloides* Giraud, according to Crawford, Proc. Ent. Soc. Washington, vol. 19, p. 167, 1917.

Volucellobombus SKORIKOV.

Bul. Sta. Région. Protect. Plantes Petrograd, vol. 4, p. 149, 1922.

Type.—(*Bombus*) *Volucellobombus volucelloides* (GRIBODO), 1891. (Monobasic.)

(*Xanthidium* ROBERTSON, not EHRENBERG, 1833) = *Heminomada* COCKERELL.

Can. Ent., vol. 35, pp. 174 and 177, 1903. Three species.

Type.—*Nomada lutcola* OLIVIER, 1811. (Original designation.)

Xanthidium Robertson is preoccupied, but since it is considered by Swenk, Univ. Studies, Lincoln, Nebr., vol. 12, p. 9, 1912, to be synonymous with *Heminomada* Cockerell, no name is proposed to replace it.

Xanthosarus ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 168 and 172, 1903.

Type.—*Megachile latimanus* SAY, 1823. (Monobasic and original designation).

Xanthosmia ROBERTSON.

Trans. Amer. Ent. Soc., vol. 29, pp. 166 and 171, 1903.

Type.—*Osmia cordata* ROBERTSON, 1902. (Monobasic and original designation.)

Synonym of *Nothosmia* Ashmead, according to Sandhouse, Mem. Ent. Soc. Washington, No. 1, p. 63, 1939.

Xenoglossa F. SMITH.

Catalogue of hymenopterous insects . . . British Museum, pt. 2, p. 315, 1854.

Type.—*Xenoglossa fulva* F. SMITH, 1854. (Monobasic.)

Xenoglossodes ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 63, 1899.

Type.—*Melissodes albata* CRESSON, 1872. (Monobasic and original designation.)

Xeralictus COCKERELL.

Pan-Pacific Ent., vol. 4, p. 41, 1927.

Type.—*Xeralictus timberlakei* COCKERELL, 1927. (Monobasic.)

Xeromegachile MITCHELL.

Trans. Amer. Ent. Soc., vol. 59, pp. 302 and 309, 1934. Many species.

Type.—*Megachile integra* CRESSON, 1878. (Original designation.)

Proposed as a subgenus of *Megachile* Latreille.

Xeromelecta LINSLEY.

Ann. Ent. Soc. Amer., vol. 32, p. 450, 1939.

Type.—*Bombomelecta larreae* COCKERELL, 1900. (Monobasic and original designation.)

Proposed as a subgenus of *Melecta* Latreille.

Xeromelissa COCKERELL.

Ann. Mag. Nat. Hist., ser. 9, vol. 17, p. 211, 1926.

Type.—*Xeromelissa wilmattae* COCKERELL, 1926. (Monobasic.)

Xerophasma COCKERELL.

Amer. Mus. Novitates, no. 66, p. 1, 1923.

Type.—*Xerophasma bequaerti* COCKERELL, 1923. (Monobasic and original designation.)

Xilocopa LATREILLE (=Xylocopa LATREILLE).

Histoire naturelle de fourmis, p. 431, 1802. Three species.

Type.—(*Xylocopa violacea* FABRICIUS, 1804) = *Apis violacea* LINNAEUS, 1758.

(By designation of Latreille, Considérations générales . . . des insectes, p. 439, 1810.)

The amended spelling, *Xylocopa*, has been generally accepted.

(Xylocopa LATREILLE) for Xilocopa LATREILLE.

Histoire naturelle . . . des crustacés et des insectes, vol. 2, p. 379, 1802.

Zacesta ASHMEAD.

Trans. Amer. Ent. Soc., vol. 26, p. 73, 1899.

Type.—*Zacesta rufipes* ASHMEAD, 1899. (Monobasic and original designation.)

Synonym of *Hesperapis* Cockerell, according to Michener, Ent. News, vol. 47, p. 184, 1936.

Zacosmia ASHMEAD (=Micromelecta BAKER).

Psyche, vol. 8, p. 282, 1898.

Type.—*Melecta maculata* CRESSON, 1879. (Monobasic and original designation.)

Isogenotypic with *Micromelecta* Baker.

Zadontomerus ASHMEAD (=Zadontomerus COCKERELL AND PORTER).

Trans. Amer. Ent. Soc., vol. 26, p. 69, 1899.

Type.—*Ceratina tejonensis* CRESSON, 1864. (Monobasic and original designation.)

Zalygus COCKERELL.

Mem. Queensland Mus., vol. 9, p. 321, 1929.

Type.—*Zalygus cornutus* COCKERELL, 1929. (Monobasic.)

(Zadontomerus COCKERELL AND PORTER) for Zadontomerus ASHMEAD.

Ann. Mag. Nat. Hist., ser. 7, vol. 4, p. 406, 1899.

Zaperdita ROBERTSON.

Ent. News, vol. 29, p. 91, 1918.

Type.—*Perdita maura* COCKERELL, 1901. (Monobasic and original designation.)

Zonandrena HEDICKE.

Mitt. Zool. Mus. Berlin, vol. 19, p. 220, 1933. Eight species.

Type.—*Andrena flavipes* PANZER, 1799. (Original designation.)

Proposed as a subgenus of *Andrena* Fabricius.

Zonohirsuta MA.

Rec. Indian Mus., vol. 40, pp. 270 and 300, 1938.

Type.—*Xylocopa collaris* LEPELETIER, 1841. (Monobasic and original designation.)

Proposed as a subgenus of *Xylocopa* Latreille.

SPECIES INDEX

In this index, valid specific names are in roman and synonyms in italics. Wherever the specific name is followed by two or more generic names, the first of these, in brackets, represents the genus in which the species was originally described, while a name enclosed in parentheses indicates the generic placement shown in the publication cited when that differs from the original combination. The generic names not enclosed in parentheses are those under which the species will be found in the foregoing list.

	Page		Page
abdominalis Eversmann, [Phileremus] Am-		alpinum Morawitz, [Anthidium] Pseudoan-	
mobatoides.....	525	thidium.....	593
[Phileremus] Paidia.....	582	alpinus Linnaeus, [Apis] (Bremus) Alpino-	
[Phileremus] Phil-		bombus.....	524
arus.....	587	amabilis Cockerell, [Ceratina] Calloceratina..	533
abdominalis Fabricius [Thynnus] Euasplis.....	549	<i>amalthea</i> Fabricius, [Apis] Trigona.....	606
[Thynnus] (Euasplis)		amalthea Olivier, [Apis] Amalthea.....	524
Dilohopeltis.....	546	[Apis] Trigona.....	606
abdominalis Gerstaecker, Lipotriches.....	565	<i>ambiguus</i> Giraud, Epeoloides.....	548
aberrans Bridwell, [Nothylaeus] Anylaeus.....	527	<i>americana</i> Robertson, [Nomada] Nomadula...	578
<i>abnormis</i> Friese, [Stelis] Odontostelis.....	579	americanorum Klug, Ptilotopus.....	595
abrupta Say, [Anthophora] Anthemoessa.....	526	amethystina Fabricius, [Apis] Nodula.....	577
[Anthophora] Melea.....	569	analis Lepeletier, [Macrocera] (Tetralonia)	
acervorum Linnaeus, [Apis] Anthophora.....	527	MacroGLOSSA.....	566
[Apis] Megilla.....	568	[Macrocera] (Tetralonia)	
[Apis] Podalirius.....	589	MacroGLOSSAPIS.....	566
acutiferus Cockerell and Ireland, [Halictus]		andreniformis F. Smith, Calliopsis.....	533
Oxyhalictus.....	580	andrenoides Cresson, [Panurgus] Parandrena..	584
<i>adunca</i> Fabricius, [Anthophora] Hoplitis.....	559	andrenoides Spinola, [Osmia] Erythrosmia..	549
<i>adunca</i> Panzer, [Apis] Ctenosmia.....	542	<i>andrenoides</i> Viereck, Birkmania.....	531
[Apis] Hoplitis.....	559	annularis Kirby, [Melitta] (Prosopis) Lamb-	
adventor Skorikov, [Agrobombus] Adventori-		dopsis.....	562
bombus.....	522	<i>annulata</i> Fabricius, [Prosopis] Hylaeus.....	560
aethiops Cresson, [Panurgus] Pseudopanurgus.	594	<i>annulata</i> Linnaeus, [Apis] Hylaeus.....	560
<i>africana</i> Friese, [Megachile] Berna.....	530	[Apis] (Prosopis) Pecti-	
<i>africaniba</i> Strand, [Megachile] Berna.....	530	nata.....	586
agrorum Fabricius, [Apis] (Bombus) Agro-		[Apis] (Prosopis) Tri-	
bombus.....	523	chota.....	606
[Apis] Bremus.....	532	anomala W. F. Kirby, Pseudapis.....	592
albata Cresson, [Melissodes] Xenoglossodes...	607	anomalus Cockerell, Cyrtapis.....	543
albifrons Kirby, [Chelostoma] Monumetha...	574	anomalus Robertson, [Halictus] Dialictus....	545
<i>albiblasis</i> Fabricius, [Hylaeus] Ceratina.....	536	antarctica Holmberg, Scirtetica.....	598
[Hylaeus] Claviceira.....	539	[Scirtetica] Alloscirtetica.....	523
albitarsis Cresson, [Megachile] Acentron.....	522	[Scirtetica] Holmbergia-	
albitarsis, Friese, Polyglossa.....	589	pis.....	558
albiventris Cresson, [Osmia] Leucosmia.....	564	[Scirtetica] Neoscirt-	
albicuneata Cockerell, [Euryglossa] Pseud-		etica.....	576
hylaeus.....	593	antennariae Robertson, [Sphecodes] Dialonia..	545
albopictus Cockerell, Isepoolus.....	561	<i>antennata</i> Fabricius, [Eucera] Macrocera.....	566
albopilosus Lucas, [Andrena] (Panurginus)		[Eucera] Tetralonia.....	603
Scrapteroides.....	599	<i>antennata</i> Panzer, [Eucera] Macrocera.....	566
albopunctata Rossi, [Apis] Andrena.....	525	[Eucera] Tetralonia.....	603
albovittata Cockerell, [Perdita] Pentaperdita.	586	antipodes F. Smith, [Sphecodes] Binghamiella..	531
alfkeni Ducke, Anthrenoides.....	527	antiqua Germar, Aplatia.....	527*
alpigenus Morawitz [Bombus] Alpigenobom-		antiquorum Cockerell, Libellulapis.....	564
bus.....	524	apicalis Cresson, [Lithurgus] Lithurgopsis....	565

	Page		Page
<i>apicata</i> F. Smith, [Coeloxys] <i>Liothyrapis</i>	584	bicolor <i>Lepeletier</i> , [Anthidium] <i>Pachyanthi-</i>	
<i>apiformis</i> Friese, <i>Corbicula</i>	546	dium.....	581
[<i>Corbicula</i>] <i>Canephora</i>	531	<i>bicolor</i> <i>Lepeletier</i> and <i>Serville</i> , <i>Ammobates</i>	524
[<i>Corbicula</i>] <i>Canephorula</i>	534	bicolor <i>Lepeletier</i> and <i>Serville</i> , <i>Rhathymus</i> ...	595
<i>appendiculata</i> F. Smith, [Xylocopa] <i>Alloxy-</i>		[<i>Rhathymus</i>]	
<i>ocopa</i>	523	<i>Lioagstra</i>	564
<i>arcuatus</i> Robertson, [Haliplus] <i>Evyllaeus</i>	552	bicolor <i>Lepeletier</i> and <i>Serville</i> , <i>Scapter</i>	599
<i>arenarius</i> Schrottky, [Agapostemon] <i>Pseuda-</i>		<i>bicolor</i> <i>Perty</i> , <i>Lioagstra</i>	564
<i>gapostemon</i>	592	bicolor F. Smith, <i>Exoneura</i>	552
<i>argentata</i> Fabricius, [Apis] <i>Eutricharaea</i>	551	bicolor F. Smith, <i>Macrotera</i>	567
[Apis] <i>Paramegachile</i>	583	bicometes <i>Enderlein</i> , <i>Diagonozus</i>	545
<i>argentipectus</i> Cresson, <i>Monumetha</i>	574	<i>bicornis</i> Fabricius, [Anthophora] <i>Osmia</i>	580
<i>argentina</i> Friese, [Psaenythia] <i>Parapsaenythia</i>	584	<i>bicornis</i> Linnaeus, [Apis] <i>Ceratosmia</i>	536
<i>argentina</i> Holmberg, <i>Brachynomada</i>	531	[Apis] <i>Osmia</i>	580
<i>argentinum</i> Brèthes, <i>Callonychium</i>	533	[Apis] (<i>Osmia</i>) <i>Amblys</i>	524
<i>argillacea</i> Scopoli, [Apis] <i>Megabombus</i>	567	bidentata <i>Cameron</i> , <i>Sudila</i>	602
<i>armatus</i> F. Smith, [Ancyloscelis] <i>Dipedia</i>	546	[<i>Sudila</i>] <i>Ceylonicola</i>	586
<i>armaticeps</i> Cresson, [Osmia] <i>Cephalosmia</i>	535	bifasciatus <i>Jurine</i> , [Prosopis] (<i>Hylaeus</i>) <i>Kop-</i>	
<i>arnoldi</i> Brauns, [Osmia] <i>Aspidosmia</i>	529	<i>togaster</i>	561
<i>arnoldi</i> Friese, [Nomiodes] <i>Cellaria</i>	534	[Prosopis] <i>Pseudobranchi-</i>	
[Nomiodes] (<i>Cellaria</i>) <i>Cellari-</i>		<i>ata</i>	593
<i>ella</i>	534	bimaculata <i>Panzer</i> , [Apis] <i>Heliophila</i>	556
<i>articulata</i> F. Smith, [Nomada] <i>Nomadula</i>	578	[Apis] <i>Saropoda</i>	598
<i>ashtoni</i> Cresson, [Apathus] (<i>Psithyrus</i>) <i>Ash-</i>		binghami <i>Cockerell</i> , [Nomia] <i>Meganomia</i>	568
<i>tonipsithyrus</i>	528	bipunctatus <i>Fabricius</i> , [Mellinus] <i>Hylaeus</i>	560
<i>ater</i> Fabricius, <i>Panurgus</i>	582	[Mellinus] <i>Prosopis</i>	590
<i>ater</i> Saussure, [Phileremus] <i>Melanomphs</i>	569	[Mellinus] (<i>Prosopis</i>)	
<i>aterrima</i> Fabricius, [Megilla] <i>Gyrodroma</i>	555	<i>Auricularia</i>	529
<i>aterrima</i> <i>Panzer</i> , [Apis] <i>Ceraplastes</i>	535	bipunctatus <i>Radoszkowski</i> , <i>Epicharoides</i>	548
[Apis] <i>Gyrodroma</i>	555	bituberculata F. Smith, <i>Megalopta</i>	568
[Apis] <i>Stelis</i>	601	bituberculata <i>Ritsema</i> , [Megachile] <i>Amega-</i>	
[Apis] (<i>Stelis</i>) <i>Gymnus</i>	555	<i>chile</i>	524
[Apis] <i>Trachusa</i>	605	bivittatum <i>Cresson</i> , [Anthidium] (<i>Stelis</i>)	
<i>atra</i> Friese, <i>Ceylonicola</i>	536	<i>Odontostelis</i>	579
<i>atra</i> Friese, [Centris] <i>Melanocentris</i>	569	oizonata <i>Holmberg</i> , <i>Doeringiella</i>	546
<i>atra</i> <i>Panzer</i> , [Trachusa] <i>Panurgus</i>	582	ocandei <i>Spinola</i> , [Mellipona] <i>Meliponula</i>	570
<i>atripes</i> Cresson, [Melissodes] <i>Epimelissodes</i>	548	bombiformis <i>Cresson</i> , [Melissodes] <i>Emphor</i>	547
<i>aulica</i> Morawitz, [Andrena] <i>Schizandrena</i>	598	bombiformis F. Smith, [Saropoda] <i>Asaropoda</i>	528
<i>aureopilos</i> <i>Spinola</i> , <i>Exomalopsis</i>	552	bombiformis <i>Gerstaecker</i> , [Megachile] <i>Gron-</i>	
<i>auricomus</i> Robertson, <i>Bombias</i>	531	<i>oceras</i>	555
<i>aureifuscus</i> <i>Titus</i> , <i>Chrysopheon</i>	538	bombilans <i>Holmberg</i> , <i>Svastra</i>	602
<i>aurulenta</i> <i>Panzer</i> , [Apis] <i>Helicostmia</i>	556	bomboides F. Smith, [Xylocopa] <i>Bombo-</i>	
<i>aurulentocaudata</i> <i>Dours</i> , [Anthophora] <i>Melli-</i>		<i>xylocopa</i>	531
<i>turgopsis</i>	572	bombycina <i>Radoszkowski</i> , [Megachile] <i>Eu-</i>	
<i>australensis</i> <i>Perkins</i> , <i>Neoceratina</i>	575	<i>megachile</i>	550
<i>australis</i> <i>Guérin</i> , [Andrena] <i>Mellitidia</i>	572	bombylans <i>Fabricius</i> , [Apis] (<i>Centris</i>) <i>Lestis</i>	563
<i>azurea</i> <i>Lepeletier</i> and <i>Serville</i> , [Mesocheira]		börneri <i>Alfken</i> , <i>Compsoemellisa</i>	540
<i>Melissa</i>	570	bradleyi <i>Viereck</i> , [Andrena] <i>Conandrena</i>	540
[<i>Mesocheira</i>]		brasiliensis <i>Blanchard</i> , [Apis] <i>Ancyloscelis</i>	525
<i>Mesopila</i>	573	brasiliensis <i>Friese</i> , <i>Parammobates</i>	584
<i>banksiana</i> <i>Kirby</i> , [Apis] <i>Panurgus</i>	582	brasiliensis <i>Lepeletier</i> and <i>Serville</i> , <i>Monocera</i>	574
<i>barbutellus</i> <i>Kirby</i> , [Apis] (<i>Psithyrus</i>) <i>Allo-</i>		<i>brasiliensis</i> <i>Schrottky</i> , <i>Friesea</i>	553
<i>sithyrus</i>	523	[<i>Friesea</i>] <i>Parafriesea</i>	583
<i>barrei</i> <i>Radoszkowski</i> , <i>Paracoeloxys</i>	583	braunsi <i>Friese</i> , <i>Melitturgula</i>	592
<i>basalis</i> <i>Ritsema</i> , <i>Parevaspis</i>	585	braunsiana <i>Friese</i> , <i>Capicola</i>	534
<i>basizona</i> <i>Spinola</i> , <i>Tetralonia</i>	603	breviceps <i>Friese</i> , [Euera] <i>Cubitalia</i>	543
<i>beardsleyi</i> <i>Cockerell</i> , <i>Greeleyella</i>	555	brevicornis <i>Nylander</i> , [Hylaeus] (<i>Prosopis</i>)	
<i>beata</i> <i>Cockerell</i> , [Perdita] <i>Phloxanthus</i>	587	<i>Dentigera</i>	544
<i>bella</i> <i>Cresson</i> , [Nomada] <i>Gnathias</i>	554	[<i>Hylaeus</i>] (<i>Prosopis</i>)	
<i>bequaerti</i> <i>Cockerell</i> , <i>Xerophasma</i>	608	<i>Imperfeta</i>	560
<i>beroni</i> <i>Schrottky</i> , <i>Oxyndys</i>	580	brevicornis <i>Panzer</i> , [Tiphia] <i>Blastes</i>	530
<i>betheli</i> <i>Ashmead</i> , <i>Melanostelis</i>	569	[Tiphia] (<i>Blastes</i>) <i>Psittes</i>	585
bicolor <i>Fabricius</i> , [Andrena] <i>Euandrena</i>	549	[Tiphia] <i>Rhineta</i>	596
bicolor <i>Fabricius</i> , [Melecta] <i>Mesocheira</i>	572	brevipennis <i>Cameron</i> , <i>Aglaeopsis</i>	522
bicolor <i>Lepeletier</i> , <i>Ammobates</i>	524	brevipennis <i>Cockerell</i> , <i>Protomelecta</i>	592
bicolor <i>Lepeletier</i> , <i>Mesocheira</i>	572	brevis <i>Say</i> , [Megachile] <i>Litomegachile</i>	565

Page		Page
	<i>bribeensis</i> Cockerell, [Parasphocodes] Aphallo-	
	trus.....	527
	<i>bruneri</i> Lepelletier, Scapter.....	599
	<i>bruneri</i> Ashmead, Caenonomada.....	532
	[Caenonomada] Chacoana.....	536
	<i>bruneri</i> Ashmead, Perditomorpha.....	587
	<i>bucinus</i> Vachal, [Haliectus] Indohaliectus.....	560
	<i>bucephala</i> Cresson, [Osmia] Centrosmia.....	535
	<i>byssina</i> Panzer, [Apis] Diphysa.....	546
	[Apis] Trachusa.....	005
	<i>caeruleus</i> Spinola, Pasiphae.....	585
	<i>calcarata</i> Friese, Samba.....	597
	<i>calcarata</i> Scopoli, [Apis] Eriops.....	549
	[Apis] Panurgus.....	582
	<i>calendarius</i> Panzer, [Apis] Evodia.....	552
	<i>californica</i> Cresson, [Melecta] Melectomorpha.....	570
	<i>californica</i> Viereck, [Melitta] Brachycephalapis.....	531
	<i>callops</i> Cockerell and Porter, Hypomacrotera.....	560
	<i>calocharti</i> Cockerell, Betheliella.....	530
	<i>campanulae</i> Cockerell, [Haliectoides] Parahaliectoides.....	583
	<i>campanulae</i> Robertson, Oligotropus.....	579
	<i>campanularum</i> Kirby, [Apis] Hierades.....	557
	<i>campestris</i> Panzer, [Apis] (Psithyrus) Metapsithyrus.....	573
	<i>canadensis</i> Cresson, [Osmia] Monilosmia.....	574
	<i>canadensis</i> Sladen, Autochelostoma.....	530
	<i>canaliculata</i> F. Smith, Meroglossa.....	572
	<i>candida</i> F. Smith, [Allodape] Macrogalea.....	566
	<i>canus</i> Eversmann, [Rhophites] Rhophitoides.....	597
	<i>capensis</i> Friese, [Omachtes] Pseudodichroa.....	593
	<i>capicola</i> Strand, [Omachtes] Sphecodopsis.....	600
	<i>capillatus</i> Rayment, [Paracolletes] Heterocolletes.....	558
	<i>carbonaria</i> Linnaeus, [Apis] (Andrena) Glyphandrena.....	554
	<i>carinata</i> Cameron, Ctenonomia.....	542
	<i>carinata</i> Cresson, [Hierades] Physostetha.....	588
	<i>carinata</i> F. Smith, [Scapter] Melittosmithia.....	572
	[Scapter] Smithia.....	600
	<i>carnifex</i> Gerstaecker, Omachtes.....	580
	<i>ceanothi</i> Cockerell, Raphidostoma.....	595
	<i>centuncularis</i> Linnaeus, [Apis] Megachile.....	567
	[Apis] (Megachile) Anthemois.....	526
	<i>cephalica</i> Provancher, Gnathocera.....	554
	<i>cephalicus</i> Robertson, Paralictus.....	583
	<i>cephalotes</i> Dalla Torre, [Haliectus] Paralictus.....	583
	<i>chacabucensis</i> Holmberg, Tapinotaspis.....	603
	<i>chalcidiformis</i> Meade-Waldo, Idioprosopis.....	560
	<i>chalybea</i> F. Smith, Ctenoplectra.....	542
	<i>chalybeata</i> Erichson, [Andrena] Lamprocolletes.....	562
	<i>chalybeata</i> F. Smith, [Nomia] Paranomia.....	584
	<i>chalybeus</i> Cresson, [Panurgus] Diandrena.....	545
	<i>chamaesarachae</i> Cockerell, [Perdita] Geoperdita.....	554
	<i>chandleri</i> Ashmead, Crocisaspidia.....	541
	<i>chichimeca</i> Cresson, [Megachile] Neomegachile.....	575
	<i>chilensis</i> Friese, Herbstiella.....	557
	[Herbstiella] Kelita.....	561
	<i>chilensis</i> Spinola, [Colletes] Cadeguala.....	532
	<i>chlerogas</i> Vachal, [Haliectus] Chlerogas.....	538
	<i>cincta</i> Jurine, [Trachusa] Dioxys.....	546
	<i>cinctiventris</i> Friese, [Capicola] Rhinochaetula.....	596
	<i>cineraria</i> Fabricius [Apis] Andrena.....	525
	<i>cineraria</i> Linnaeus, [Apis] Andrena.....	525
	<i>cinerarius</i> Cameron, Plesioanurgus.....	588
	<i>cinnabarina</i> Friese, Prodiorys.....	590
	<i>cirsii</i> Verhoeff, Sabulicola.....	597
	<i>cladocerus</i> F. Smith, [Lamprocolletes] Cladocerapis.....	539
	<i>clavicornis</i> Latreille, [Eucora] Melitturga.....	572
	<i>clavipes</i> Dours, [Haliectus] Lucasellus.....	565
	[Haliectus] Lucasellus.....	565
	[Haliectus] Lucasus.....	566
	<i>clavipes</i> Fabricius, [Centris] Tetragona.....	602
	<i>claviventris</i> Thomson, [Osmia] Liosmia.....	564
	<i>clypeata</i> Sladen, Formicapis.....	553
	<i>coccineus</i> Friese, [Bombus] (Alpigenobombus) Coccineobombus.....	539
	<i>coccineus</i> Fabricius, [Apis] Epeoloides.....	548
	<i>coerulea</i> Fabricius [Bombus] (Xylocopa) Cyaneoderes.....	543
	<i>coerulea</i> Lepelletier and Serville, Aglae.....	522
	<i>coeruleus</i> Lepelletier and Serville, Mesonychium.....	573
	<i>collaris</i> Lepelletier, [Xylocopa] Zonohirsuta.....	608
	<i>combusta</i> F. Smith, [Megachile] (Gronoceras) Digronoceras.....	546
	<i>compactula</i> Cockerell, Anthophorula.....	527
	<i>compta</i> Cresson, [Melissodes] Abda.....	521
	[Melissodes] Anthedon.....	526
	<i>conanthi</i> Cockerell, [Haliectus] Conanthalicus.....	540
	<i>concaus</i> Cresson, [Epeolus] Triepeolus.....	606
	<i>concinna</i> Fabricius, [Vespa] Hyleoides.....	560
	<i>condigna</i> Cresson, [Melissodes] Florilegus.....	553
	<i>confusa</i> Pérez, [Xylocopa] Euryapis.....	551
	[Xylocopa] Orbitella.....	580
	<i>confusus</i> Schenck, [Bombus] Confusibombus.....	540
	[Bombus] Suleobombus.....	602
	<i>conica</i> Fabricius [Anthopora] Coelioxys.....	539
	<i>conica</i> Linnaeus [Apis] Coelioxys.....	539
	<i>conjuncta</i> Cresson, [Osmia] Diceratosima.....	545
	<i>conspicua</i> F. Smith, [Pachymelus] Pachymelopsis.....	581
	<i>contradicta</i> Cockerell, [Megalopta] Megaloptidia.....	568
	<i>coquilletti</i> Ashmead, Diadasella.....	545
	<i>cordata</i> Fabricius, Euglossa.....	550
	<i>cordata</i> Linnaeus, [Apis] Euglossa.....	550
	[Apis] (Euglossa) Cnemidium.....	539
	<i>cordata</i> Robertson, [Osmia] Xanthosmia.....	607
	<i>coriaceus</i> F. Smith, [Haliectus] Curtisapis.....	543
	<i>cornigera</i> Cockerell, [Exomalopsis] Pachycerapis.....	581
	<i>cornuta</i> Cresson, [Centris] Gundlachia.....	555
	[Centris] Heterocentris.....	558
	[Centris] Rhodocentris.....	596
	<i>cornuta</i> Fabricius, [Andrena] (Centris) Lithurge.....	565
	<i>cornuta</i> F. Smith, [Hylaeus] (Proeopsis) Abrupta.....	521
	<i>cornutus</i> Cockerell, Zalygus.....	608
	<i>crabronina</i> Holmberg, Caenoprosopis.....	532
	<i>crassipes</i> F. Smith, Paracolletes.....	583
	<i>cressoni</i> Robertson, [Haliectus] Chloralictus.....	539
	<i>cressoni</i> Robertson, [Andrena] Opandrena.....	580
	<i>cressonii</i> Robertson, Sphecodium.....	600
	<i>cribratus</i> Bridwell, Metylaeus.....	573

	Page		Page
<i>cristariae</i> Jörgensen, Holmbergeria.....	558	<i>duboulai</i> F. Smith, Thaumatosoma.....	604
<i>cristata</i> Fonscolombe, [Megachile] <i>Pseudosmia</i>	564	<i>ducalis</i> F. Smith, Ptiloglossa.....	594
<i>cucurbitina</i> Rossi, [Apis] <i>Ceratina</i>	536	<i>dybowskii</i> Radoszkowski, [Halictus] <i>Acanthaliectus</i>	521
[Apis] <i>Claviera</i>	539	<i>eamia</i> Cockerell, Neopasites.....	576
<i>cullumanus</i> Kirby, [Apis] (<i>Bombus</i>) <i>Cullumanobombus</i>	543	<i>edwardsii</i> Cresson, [Melecta] <i>Melectomimus</i>	570
<i>cupreochalybea</i> F. Smith, Euryglossa.....	551	<i>edwardsii</i> Cresson, [Melissodes] (<i>Synhalonia</i>) <i>Eusynhalonia</i>	551
<i>curta</i> Provancher, [Anthophora] <i>Micranthophora</i>	573	<i>elegans</i> F. Smith, <i>Stenotritus</i>	601
<i>curvatum</i> F. Smith, [Anthidium] <i>Dianthidium</i>	545	<i>elegantula</i> Cockerell, <i>Hesperapis</i>	557
<i>curvicastrata</i> Cameron, [Prosopis] <i>Deranchylaeus</i>	544	<i>elongata</i> Lepeletier and Serville, [Trigona] <i>Tetragona</i>	603
<i>curvicornis</i> Scopoli, [Eucera] <i>Systropha</i>	602	<i>emarginata</i> Lepeletier, [Osmia] <i>Aceratosmia</i>	522
<i>curvipes</i> Fabricius, [Andrena] <i>Nitocris</i>	577	<i>emarginatus</i> Schenck, [Phileromus] <i>Blastoides</i>	530
[Andrena] <i>Nomia</i>	578	<i>enavata</i> Cresson, [Melissodes] <i>Diadasia</i>	545
<i>curvungula</i> Thomson, [Andrena] <i>Lepidandrena</i>	563	<i>encellae</i> Cockerell, [Andrena] <i>Megandrena</i>	568
<i>cuspidata</i> Alfken, Ensliniana.....	547	<i>erberi</i> Morawitz, [Andrena] <i>Campylogaster</i>	534
<i>cyanura</i> Cockerell, [Ceratina] <i>Chloroceratina</i>	538	<i>ericetorum</i> Lepeletier, [Megachile] <i>Pseudomegachile</i>	594
<i>cylindricus</i> Cresson, Andronicus.....	526	<i>erigeniae</i> Robertson, [Andrena] <i>Ptilandrena</i>	594
<i>darwinii</i> Cockerell, [Corynura] <i>Corynuroides</i>	510	<i>erigeronis</i> Robertson, [Nomada] <i>Centrias</i>	534
[Corynura] <i>Corynuropsis</i>	541	<i>eucalypti</i> Cockerell, [Meroglossa] <i>Meroglossula</i>	572
<i>dasyptoda</i> Illiger, [Centris] <i>Epicharis</i>	548	<i>euglossoides</i> Lepeletier and Serville, <i>Melitoma</i>	571
<i>decipiens</i> Spinola, [Coelioxys] <i>Liothyrapis</i>	564	[Melitoma] <i>Meliphila</i>	570
[Coelioxys] <i>Paracoelioxys</i>	583	<i>euxantha</i> Cockerell, [Spinoliella] <i>Claremontiella</i>	539
<i>decorata</i> F. Smith, <i>Oxytroglossa</i>	581	<i>euxantha</i> Cockerell, [Prosopis] <i>Gnathoprosopis</i>	554
<i>delicata</i> Cockerell, <i>Heterapis</i>	557	<i>excellens</i> Friese, Kuherbstia.....	550
[Heterapis] <i>Heterapoides</i>	557	<i>exil</i> Skorikov, [Muscidobombus] <i>Exilobombus</i>	552
<i>dentata</i> Fabricius, [Euryglossa] <i>Exaerete</i>	552	<i>extraordinarius</i> Kohl, [Halictus] <i>Echthralictus</i>	547
<i>dentata</i> Linnaeus, [Apis] <i>Exaerete</i>	552	<i>ezonata</i> F. Smith, <i>Habrophora</i>	556
[Apis] (<i>Exaerete</i>) <i>Calindra</i>	533	[Habrophora] <i>Habropoda</i>	556
[Apis] (<i>Exaerete</i>) <i>Chrysanthoda</i>	538	<i>fabriciana</i> Linnaeus, [Apis] <i>Nomada</i>	577
<i>dentatus</i> Rayment, <i>Nodocolletes</i>	577	<i>facilis</i> F. Smith, [Prosopis] <i>Nesoprosopis</i>	576
<i>denticus</i> Friese, <i>Rhinetula</i>	596	<i>fairchildi</i> Ashmead, <i>Cyaneoderes</i>	543
<i>denticulatus</i> F. Smith, <i>Serapis</i>	599	<i>falcifer</i> Patton, [Sphecodes] <i>Drepanium</i>	547
[Serapis] <i>Serapista</i>	599	<i>fasciata</i> Radoszkowski, <i>Euthyglossa</i>	551
<i>dentiventris</i> Nylander, <i>Halitoides</i>	556	<i>fasciata</i> Friese, [Centris] <i>Poecilocentris</i>	599
<i>depressa</i> Friese, [Ammobates] <i>Caesarea</i>	532	<i>fasciatus</i> Holmberg, <i>Pseudepeolus</i>	593
<i>detersa</i> Cockerell, [Megachile] <i>Andrognella</i>	525	<i>fasciatus</i> Panzer, <i>Bremus</i>	532
<i>diabolica</i> Friese, [Melissa] (<i>Hopliphora</i>) <i>Cyphomelissa</i>	543	<i>fatalis</i> Cockerell, <i>Sophrobombus</i>	600
<i>diacantha</i> Eversmann, [Melecta] <i>Pseudomelecta</i>	594	<i>favosa</i> Fabricius, [Apis] <i>Melipona</i>	570
<i>dichroa</i> F. Smith, [Pasites] <i>Morgania</i>	574	<i>femorals</i> Guérin, [Apis] (<i>Andrena</i>) <i>Agapostemon</i>	522
<i>dichroa</i> Spinola, [Ammobates] <i>Omachtes</i>	580	<i>fenestrata</i> Fabricius, [Apis] <i>Baana</i>	530
<i>difformis</i> Gribodo, <i>Scapteroides</i>	599	[Apis] <i>Ctenopoda</i>	542
<i>difformis</i> F. Smith, [Centris] <i>Gundlachia</i>	555	<i>fenningeri</i> Viereck, [Andrena] <i>Scapteropsis</i>	599
[Centris] <i>Heterocentris</i>	558	<i>fernaldae</i> Franklin, [Psithyrus] <i>Fernaldaepisthyrus</i>	552
[Centris] <i>Rhodocentris</i>	596	<i>feroni</i> Pérez, <i>Solenopalpa</i>	600
<i>diligens</i> F. Smith, <i>Lagobata</i>	562	<i>fervidus</i> Fabricius, [Apis] (<i>Bremus</i>) <i>Fervidobombus</i>	553
<i>dimidiata</i> Fabricius, [Apis] <i>Centris</i>	535	<i>fielbrigi</i> Bréthes, <i>Protodiscelis</i>	592
[Apis] <i>Eulaema</i>	550	<i>flavescens</i> Klug, <i>Oxaea</i>	580
<i>discolor</i> F. Smith, <i>Cacosoma</i>	532	[Oxaea] <i>Dasyglossa</i>	544
[Cacosoma] <i>Neocorynura</i>	575	<i>flavicornis</i> Morawitz, [Osmia] <i>Stenosmia</i>	601
<i>discrepans</i> Holmberg, <i>Lanthanomelissa</i>	562	<i>flavida</i> Friese, <i>Poecilomelitta</i>	589
<i>distincta</i> Cresson, [Osmia] <i>Nothosmia</i>	578	<i>flavifrons</i> F. Smith, [Calliopsis] (<i>Camptopoeum</i>) <i>Friesea</i>	553
<i>distingueundus</i> Schenck, <i>Rhopitoides</i>	597	[Calliopsis] (<i>Camptopoeum</i>) <i>Parafriesea</i>	583
<i>diversipes</i> Klug, <i>Tetrapedia</i>	604		
<i>diversipes</i> Latreille, <i>Nomia</i>	578		
[Nomia] <i>Nomiapis</i>	578		
<i>diversus</i> F. Smith, (<i>Bombus</i>) <i>Diversobombus</i>	546		
<i>dorsale</i> Lepeletier, [Anthidium] <i>Heteranthidium</i>	557		
<i>dorsata</i> Fabricius, [Apis] <i>Megapis</i>	568		

	Page		Page
<i>flavilabris</i> Lucas, [Nomia] Plistotrichia.....	588	<i>giannellii</i> Gribodo, [Epeolus] Diepeolus.....	546
<i>flavipes</i> Panzer, [Andrena] Zonandrena.....	608	<i>gibba</i> Fabricius, [Nomada] Sphecodes.....	600
<i>flavipes</i> Spinola, [Megachile] Archimegachile.....	528	<i>gibba</i> Linnaeus, [Spheg] Dichroa.....	545
<i>flavo(fasciatus</i> Spinola, [Halictus] (Corynura)		[Spheg] Sphecodes.....	600
<i>Rhopalictus</i>	596	<i>giganteus</i> Cockerell, [Palaeorhiza] (Hylaeus)	
<i>flavomarginatum</i> F. Smith, [Anthidium]		Meghylaues.....	568
<i>Hypanthidium</i>	560	<i>gilberti</i> Cockerell, Turnerella.....	607
<i>flavorufus</i> Cockerell, Adrenopsis.....	525	<i>glabratus</i> Cresson, [Epeolus] Pyrrhomolecta.....	595
<i>flora</i> Fabricius, [Apis] Micrapis.....	573	<i>gleasoni</i> Titus, Robertsonella.....	597
<i>floridana</i> F. Smith, [Anthophora] (Habropoda)		<i>globulifera</i> Cockerell, [Gnathoprosopis]	
<i>Emphoropsis</i>	547	Sphaerhylaues.....	600
<i>florissantensis</i> Cockerell, Calyptapis.....	533	<i>gloriosa</i> Fox, [Megacilissa] (Oxaea) Protoxaea.....	592
<i>florisomnis</i> Linnaeus, [Apis] Chelostoma.....	537	<i>glutinosa</i> Giraud, [Heriades] Protosmia.....	592
[Apis] Heriades.....	557	<i>goeldiana</i> Friese, [Tetrapedia] Lanthanome-	
<i>fonscolombi</i> Romand, Mellissodes.....	571	llissa.....	562
<i>fortis</i> Cresson, [Megachile] Phaenoserus.....	587	[Tetrapedia] Schrottkya.....	598
<i>fragilis</i> F. Smith, [Andrena] Tropandrena.....	606	<i>goryi</i> Romand, [Acanthopus] Ctenioschelus.....	541
<i>fraternus</i> F. Smith, [Apathus] (Alpigenobom-		[Acanthopus] (Ctenioschelus)	
<i>bombus</i>) <i>Fraternobombus</i>	553	Melissoda.....	571
<i>freygessneri</i> Friese, [Stelis] Protostelis.....	592	<i>graeffei</i> Alfken, [Colletes] Denticolletes.....	544
<i>friesei</i> Alfken, [Prosopis] Barbata.....	530	<i>graga</i> Eversmann, [Macrocera] Tetraloniella.....	603
[Prosopis] Mehelya.....	569	<i>grala</i> Eversmann, [Macrocera] Tetraloniella.....	603
[Prosopis] Mehelyana.....	569	<i>grandidieri</i> Buysson, Thrausus.....	604
<i>friesei</i> Brauns, Parafidela.....	583	<i>grandis</i> Morawitz, [Osmia] Megalosmia.....	568
<i>friesei</i> Duche, Rhophitulus.....	597	<i>gratiosa</i> F. Smith, [Augochlora] Augochlorella.....	529
<i>frigida</i> F. Smith, [Megachile] Delomegachile.....	544	<i>gratiosus</i> Holmberg, Epimomispractor.....	548
<i>frisel</i> Duche, Rhophitulus.....	597	<i>greavesi</i> Rayment, Melitribus.....	571
<i>frontalis</i> Fabricius, [Prosopis] Camptopoeum.....	534	<i>gribodii</i> Magretti, [Trigona] Hypotrigona.....	560
<i>fructifera</i> Holmberg, Teleutemnesta.....	603	<i>grindeliae</i> Cockerell, [Nomada] Melanomada.....	569
<i>fuchsi</i> Viereck, Panurgonia.....	582	<i>grisea</i> Westwood, Monia.....	574
<i>fuciformis</i> Latreille, [Osmia] Melanosmia.....	569	[Monia] Monidia.....	574
<i>fulgida</i> Cresson, [Osmia] Chlorosmia.....	538	<i>griseocolis</i> Degeer, [Apis] Separatobombus.....	599
<i>fulva</i> Lepeletier, Mellipona.....	570	<i>haemorrhoidalis</i> Fabricius, [Andrena] Cilissa.....	538
<i>fulva</i> F. Smith, Xenoglossa.....	607	<i>haemorrhoidalis</i> Fabricius, [Apis] (Centris)	
<i>fulvago</i> Christ, [Apis] (Andrena) Chrysan-		hemisia.....	557
<i>drena</i>	538	<i>haemorrhoidalis</i> Panzer [Andrena] Cilissa.....	538
<i>fulvicollis</i> Spinola, [Caupolicana] Megacilissa.....	567	<i>halictoides</i> Holmberg, Leptergatis.....	563
<i>fulvitarsis</i> Cresson, [Melissodes] Synhalonia.....	602	<i>halictoides</i> F. Smith, [Andrena] (Halictus)	
<i>fulviventris</i> Cresson, [Phileremus] Gnathopa-		Nesohalictus.....	576
<i>sites</i>	554	<i>halictoides</i> F. Smith, Perdita.....	586
[Phileremus] Neopasites.....	576	<i>hatteriana</i> Fabricius, [Nomada] (Andrena)	
<i>fulviventris</i> Panzer, [Apis] Chalcosmia.....	537	Charitandrena.....	537
<i>fulvo-crustatus</i> Dours, [Andrena] Campylo-		<i>helvola</i> Linnaeus, [Apis] Andrena.....	525
<i>gaster</i>	534	[Apis] Anthochaeressa.....	526
<i>fulvohirta</i> Cameron, Paracentris.....	582	<i>henshawi</i> Cockerell, [Apis] Synapis.....	602
<i>fulvopilosa</i> Spinola, Exomalopsis.....	552	<i>heraldica</i> F. Smith, [Prosopis] Nothylaues.....	578
<i>fulvipilosum</i> Cameron, Plesianthidium.....	588	<i>herbsti</i> Friese, [Colletes] Pollicana.....	589
<i>fumida</i> Cockerell, Thygatina.....	604	<i>herbsti</i> Vachal, Lonchopria.....	565
<i>funebria</i> Panzer, Andrena.....	525	<i>heterodoxa</i> Cockerell, [Andrena] Ancylan-	
<i>funebria</i> F. Smith, [Bombus] (Alpigeno-		drena.....	525
<i>bombus</i>) <i>Funebribombus</i>	553	<i>heterodoxa</i> Cockerell, [Polyglossa] Parapoly-	
<i>funereus</i> F. Smith, Eurytis.....	551	glossa.....	584
<i>fuscipennis</i> Crawford, Protandrenopsis.....	591	<i>heterodoxus</i> Cockerell, Notocolletes.....	578
<i>fuscipennis</i> Fairmaire, Diobopeltis.....	546	<i>hieroglyphica</i> F. Smith, [Ceratina] Cerati-	
<i>gabonica</i> Gribodo, Koptortosoma.....	561	nidia.....	536
<i>gayatinus</i> Spinola, [Halictus] Presbia.....	590	<i>hilactus</i> F. Smith, Parasphecodes.....	585
<i>gayi</i> Spinola, Caupolicana.....	534	<i>hirsutulum</i> Spinola, [Camptopoeum] Liopoe-	
<i>gayi</i> Spinola, [Halictus] Corynogaster.....	540	um.....	564
[Halictus] Corynura.....	540	<i>hirtipes</i> Fabricius, [Andrena] Dasypoda.....	544
[Halictus] Manuela.....	567	[Andrena] Podasys.....	589
<i>gayi</i> Spinola, Diphaglossa.....	546	<i>hirtipes</i> Fabricius, [Apis] Centris.....	535
<i>gayi</i> Spinola, Epiclopus.....	548	[Apis] (Centris) Epicharis.....	548
<i>georgica</i> Cresson, [Megachile] Gnathodon.....	584	<i>hirtipes</i> Morawitz, Tarsalia.....	603
[Megachile] Sarogaster.....	598	<i>histris</i> Fabricius, [Nomada] Melecta.....	570
<i>georgica</i> Cresson, [Osmia] Gnathosmia.....	555	<i>histrionica</i> Illiger, [Melecta] Crocisa.....	541
<i>gerstaeckeri</i> Schulz, Morgania.....	574	<i>holosericea</i> Schrottky, Odyneropsis.....	579

	Page		Page
horni Strand, [Haliectus] Ceylaliectus.....	536	larreae Cockerell, [Bombomelecta] Xeromelecta	608
hortorum Linnaeus, [Apis] (Bombus) Hortobombus	559	larreae Cockerell, [Perdita] Perditiella	587
humilis Cockerell, Chalcobombus	536	lasureus Friese, [Haliectus] Calloupetersia.....	533
humilis Imhof, [Andrena] Chlorandrena.....	538	lata Cresson, [Croceis] Fricrocis	549
husela Cockerell, [Prosopis] Eucrosopis.....	551	lateralis Cresson, [Stelis] Microstelis	574
hyalina Cresson, [Perdita] Cockerellia.....	539	laticeps Friese, [Anthophora] Eucara.....	549
hyalinata F. Smith, [Hylaeus] (Prosopis) Sptulariella.....	600	laticeps Morawitz, [Anthidium] Archanthidium.....	528
hypnorum Linnaeus, [Apis] (Bombus) Pyrobombus	595	latimanus Say, [Megachile] Xanthosarus.....	607
ignita F. Smith, [Augochlora] Augochloropsis.....	529	laticr Cockerell, [Perdita] Macroteropsis.....	567
ilicifoliae Cockerell, [Haliectoides] Amblyapis.....	524	latipes Drury, [Apis] Audinetia.....	529
illinoisensis Robertson, [Phileremus] Holcopasites.....	558	[Apis] Platynopoda.....	588
illustre Cresson, [Anthidium] Callanthidium.....	533	latipes Fabricius, [Xylocopa] Audinetia.....	529
imitatus F. Smith, Leioproctus.....	593	[Xylocopa] Platynopoda.....	588
incedens Holmberg, Chalchogenus.....	537	latitarsis Friese, [Trigona] Saura.....	598
incedus Cockerell, Protobombus.....	592	latreillei Lepeletier, Mellissoda.....	571
inflaticeps Ducke, [Haliectus] (Corynura vel Corynuropsis) Rhinocorynura.....	596	lecointel Ducke, [Leiodopus] Pareopolus.....	585
infragilis Cresson, [Megachile] Anthemois.....	526	lefebvrei Lepeletier, [Bompus] Alpienobombus.....	524
inquienda Vachal, Orphana.....	580	lepreuri Blanchard, [Apis] Mellissodes.....	571
[Orphana] Leptoglossa.....	563	libanensis Friese, [Exoneura] Exoneuridia.....	552
[Orphana] Ptoleglossa.....	595	ligatus Say, [Haliectus] Odontalictus.....	579
insolitus Cockerell, [Triepeolus] Synepoolus.....	602	lingusticus Spinola, [Bombus] Megabombus.....	567
integerrima Dalla Torre, [Nomada] Phor.....	587	limao F. Smith, [Trigona] Lestrimelitta.....	564
integra Cresson, [Megachile] Xeromegachile.....	607	lobata Fabricius, [Dasyptoda] Eriops.....	549
integra Robertson, [Nomada] Phor.....	587	[Dasyptoda] Panurgus.....	582
interrupta Fabricius, [Apis] Paraanthidium.....	582	lobata Panzer, [Andrena] Eriops.....	549
inyoensis Michener, [Ashmeadiella] Corythochila.....	541	[Andrena] Panurgus.....	582
ipomoeae Robertson, [Xenoglossa] Cemolobus.....	534	longiceps Ashmead, Hylaeosoma.....	559
ipomoeae Schrottky, Meliphila.....	570	longicornis Fabricius, Eucera.....	549
ireos Pallas, [Apis] (Podalirius) Paramegilla.....	584	longicornis Linnaeus, [Apis] Eucera.....	549
iridescens Friese, Protomelissa.....	592	longimana Fabricius, [Centris] Trachina.....	605
itama Cockerell, [Trigona] Heterotrigona.....	558	longula Friese, Strandiella.....	602
jacintanum Cockerell, [Chelostoma] Cephalaps.....	535	lovelli Viereck, Conohaliectoides.....	540
javanus Ritsema, Steganomus.....	601	lustris Cockerell, [Panurgus] Hemihaliectus.....	557
johnsoni Brèthes, Arhyosage.....	528	lutea Cameron, Ctenoapis.....	542
jörgenseni Friese, [Nomia] Nomocolletes.....	578	luteicornis Cockerell, [Mellissodes] Martinapis.....	567
kirbyanus Latreille, [Epeolus] Phileremus.....	587	[Mellissodes] Martinella.....	567
[Epeolus] (Phileremus) Ammobatoides.....	525	luteola Olivier, [Nomada] Xanthidium.....	607
konowi Brauns, Eucandylops.....	549	lycorias Schrottky, [Augochloropsis] Paraugochloropsis.....	585
kozlovi Skorikov, [Bombus] Kozlovibombus.....	561	macrognathus Friese, [Haliectus] Rostratilapis.....	597
labialis Kirby, [Melitta] (Andrena) Holandrena.....	558	maculata Cresson, [Melecta] Micromelecta.....	573
labiata Fabricius, Megilla.....	568	[Melecta] Zacosmia.....	608
[Mogilla] Macropis.....	566	maculata Jurine, Psites.....	585
labiata Fabricius, [Andrena] Poelandrena.....	589	maculipennis Cameron, Lamproapis.....	562
labiata Klug, Macropis.....	566	maculipennis Friese, [Colletes] Ptilopoda.....	594
labiata Provancher, Chelynia.....	537	malpighiacearum Ducke, Haliectanthrena.....	556
laboriosus Fabricius, [Bombus] (Psithyrus) Laboriopsithyrus.....	561	malvae Rossi, [Apis] Macrocera.....	566
lactinus F. Smith, Leiopodus.....	563	[Apis] Tetralonia.....	603
[Leiopodus] Melectoides.....	570	manicata Linnaeus, [Apis] Anthidium.....	526
laesus Morawitz, [Bombus] (Agrobombus) Laesobombus.....	561	manifestus Fox, [Panurgus] Callandrena.....	533
laevigatum F. Smith, Stilpnosoma.....	601	marginatus Cresson, [Panurgus] (Haliectoides) Epihaliectoides.....	548
lagopus Latreille, [Andrena] Scrapter.....	599	marginipennis Cresson, Eunomia.....	550
laneae Cockerell, [Perdita] Perditiella.....	587	[Eunomia] Dieunomia.....	546
lapidarius Linnaeus, [Apis] (Bombus) Lapidariobombus.....	562	mastrucatus Gerstaecker, [Bombus] Mastrucatotombus.....	567
[Apis] (Bombus) Melanobombus.....	569	maura Cockerell, [Perdita] Zaperdita.....	608
		maura Ferton, Pérezia.....	587
		[Pérezia] Fertonella.....	552
		maura Viereck, [Andrena] Dactylandrena.....	543
		maurula Cockerell, [Andrena] Protandrena.....	591

	Page		Page
maurus Cresson, [Panurgus] (Halictoides) Neohalictoides.....	575	muelda Cresson, [Melecta] Brachymelecta....	531
mariliosa Linnaeus, [Aplis] Chelostoma.....	537	mueldus Gerstaecker, [Bombus] Mueldobombus.....	574
mediorufa Cockerell, [Trigona] Oxytrigona.....	581	muelleri Cockerell, [Augochlora] Odontochlora.....	579
megachiloides Holmberg, Anthodiocetes.....	526	muelleri Friese, [Tetrapedia] Chalepogenus....	537
melanantha Linsley, Hesperonomada.....	557	[Tetrapedia] Desmotetrapedia.....	545
melanochroa Cockerell, [Andrena] Micrandrena.....	573	multiplex Vachal, [Halictus] (Augochlora) Tetrachlora.....	603
melanozantha Holmberg, Chacoana.....	536	muoti Vachal, [Dufourea] Trillia.....	606
melanura Cockerell, [Palaeorhiza] Heterorhiza.....	558	muraria Fabricius, [Xylocopa] Chalicodoma....	537
melliponoides Buttel-Reepen, [Aplis] Electrapis.....	547	[Xylocopa] Megachile.....	567
melittoides Friese, [Andrena] Melittoides.....	571	muraria Retzius, [Aplis] Chalicodoma.....	537
melittoides Viereck, Coquillettapis.....	540	[Aplis] Megachile.....	567
melittoides Viereck, Dolichochile.....	546	murina Cockerell, [Emphoropsis] Meliturgopsis.....	572
mellea Cockerell, Microdontura.....	573	muscaria Fabricius, [Aplis] (Centris) Lestis....	563
mellifera Linnaeus, Aplis.....	528	muscorum Linnaeus, [Aplis] Chromobombus.....	538
[Aplis] Apiarus.....	528	nasalis Westwood, [Xylocopa] Biluna.....	530
mellifica Fabricius, Aplis.....	528	nasicornis Friese, [Megachile] Amegachile....	524
[Aplis] Apiarus.....	527	nasoni Robertson, [Andrena] Platandrena.....	588
mellona Heer, Anthophorites.....	572	nasutum Latreille, [Anthidium] Stelidomorpha.....	601
mendax Gerstaecker, [Bombus] Mendacibombus.....	531	nasutus F. Smith, [Colletes] Rhinocolletes....	596
mengel Motschulsky, Bombusoides.....	581	natalensis Friese, Crinoglossa.....	541
merescens Cockerell, [Halictus] Pachyhalictus.....	597	neavei Blüthgen, Eupetersia.....	551
metallica Strand, Rivalsia.....	575	neglecta Dours, Biacolina.....	530
metallicum F. Smith, Mydrosoma.....	603	nellana Cockerell, [Rediviva] Notomelitta....	579
metallicum F. Smith, Temnosoma.....	544	neotropica Friese, Bicolletes.....	530
metallicus F. Smith, Dasycolletes.....	548	nesoprosopoides Bridwell, [Hylaeus] Nesylaeus.....	576
inexicanus Radoszkowski, Epelcharis.....	553	nevadensis Cresson, [Bombus] (Bremus) Nevadensibombus.....	577
[Epelcharis] Florentinia.....	598	nicholsoni Cockerell, [Stenotritus] Ctenocolletes.....	542
micans Lepelletier, [Xylocopa] Schönherria....	590	niger Nylander, Panurginus.....	582
micans Strand, Prosopalictus.....	581	nigerrimus Bischoff, Pasitomachtes.....	586
microlephas F. Smith, Pachymilus.....	587	nigra Linnaeus, [Formica] Lasius.....	563
mimus Cockerell, Phenacolletes.....	589	nigra F. Smith, [Euryglossa] Euryglossimorpha.....	551
mimus Cockerell, Polyblapis.....	551	nigriceps Kirby, [Melitta] (Andrena) Cnemidandrena.....	539
minima Cockerell, Euryglossella.....	528	nigricornis Nylander, [Heriades] Gyrodroma....	556
minimus Robertson, [Triepeolus] Argyroscelenis.....	547	nigrifrons Cresson, [Melissodes] (Diadasia) Coquillettapis.....	540
minuta Lepelletier, Dufourea.....	578	nigromarginatus Spinola, [Halictus] Pseudaugochloropsis.....	593
minutissima Rossi, [Aplis] Nomoloides.....	525	nitida Fourcroy, [Aplis] Andrena.....	525
minutula Kirby, [Melitta] (Andrena) Andrenella.....	584	nitida Kirby [Melitta] Andrena.....	525
minutus Mocsary, [Phiarus] Parammobatodes.....	605	nitida Linsley and Michener, Paranomada....	584
mirabilis Cockerell, Glyptapis.....	541	nitida Perty, Chrysantheda.....	538
mirabilis Perkins, Neopaspheae.....	522	[Chrysantheda] Callendra.....	533
mirabilis Perkins, Pachyprosops.....	574	nitidiuscula Schenck, [Andrena] Notandrena....	578
mirabilis F. Smith, [Tetralonia] Trichocerapis.....	530	nitidiventris F. Smith, [Trigona] Lepidotrigona.....	563
mitima Cockerell, [Megachile] Creightonella.....	558	nodicornis F. Smith, Cyathocera.....	543
mitis Thompson, [Osmia] Acanthosmia.....	535	nomadoides Spinola, [Camptopoeum] Spinoliella.....	601
modesta Cresson, [Nomada] Micronomada.....	586	nortonii Cresson, [Nomia] Acunomia.....	522
modesta F. Smith, [Andrena] Austrandrena.....	577	novaeangliae Viereck, [Perdita] Alloperdita....	523
mojavensis Linsley and Michener, Hexepeolus.....	582	nymphae Skorikov, [Bombus] Exilobombus....	552
montana Cresson, [Osmia] Cephalosmia.....	535	oberti Morawitz, [Bombus] Obertobombus....	579
montana Cresson, [Stelis] Pavostelis.....	580	oberti Rehnig, Obertobombus.....	579
montana Mocsary, Nomadita.....	553	obliterata Cresson, [Nomada] Heminomada....	557
montandoni Gribodo, [Coelioxys] Paracoeiloxys.....	588		
montivaga Cresson, [Megachile] Cyphopyga....	543		
montivaga Morawitz [Osmia] Acanthosmia.....	522		
morio Brullé, [Andrena] Melandrena.....	509		
morsus Cockerell, Gonocolletes.....	555		
mosquito F. Smith, [Trigona] Picbela.....	588		

	Page		Page
oblongatum Latreille, [Anthidium] Proanthidium	590	peringueyi Friese, [Andrena] Rediviva	595
obscura Swenk, Viereckella	607	pernigra Schrottky, Cyphomelissa	543
occidentalis Haliday, [Colletes] (Diphaglossa) Cadeguala	532	perpictum Cockerell, [Anthidium] Paranthidium	584
occipitale Cockerell, [Pachyanthidium] Trichanthidium	605	persimilis Cockerell, [Nomia] Eptnomia	549
ochracea Cockerell, Dasilapis	544	persimulata Viereck, [Andrena] Gonandrena	555
ochrias Vachal, [Halictus] (Megaloptya) Megaloptella	568	pertriste Cockerell, Lithanthidium	565
odontogaster Cockerell, [Osmia] Acanthosmioides	522	perviridis Cockerell, [Prosopis] Palacorchiza	582
oenotherae Mitchell, Megachiloides	567	petulans Cresson, [Megachile] Leptorachis	563
ogliviei Cockerell, [Rhinochaetula] Haplomelitta	556	phaedra Schrottky, Halictomorpha	556
ogliviei Cockerell, [Systropha] Systrophidia	602	philadelphia Robertson, [Hieriades] Prochelostoma	590
oliveirae Holmberg, Nectarodiaeta	575	philanthoides Gerstaecker, Psacynithia	592
olivieri Lepeletier, [Xylocopa] Proxylocopa	592	philanthoides Saussure, Sphegocephala	601
opalina F. Smith, Apista	528	pieta F. Smith, Callomelitta	533
[Apista] Egapista	547	pictipes Nylander, [Hylaeus] (Prosopis) Paraprosoptis	584
opuntiae Cockerell, [Hieriades] Ashmeadella	528	pletus Schrottky, Stenocolletes	601
opuntiae Cockerell, [Perdita] Cockerellula	539	plipes Cresson, [Pasites] Nomadosoma	577
[Perdita] Lutzella	566	pilipes Fabricius, [Apis] Anthophora	527
oraniensis Friese, Schmiedeknechtia	598	[Apis] Podalirius	589
oraniensis Lepeletier, Ancyra	525	pilliventris Guérin, [Euglossa] Glossura	554
[Ancyra] Plistotrichia	588	platycephala Cockerell, [Nomia] Macro-	566
oraniensis Lepeletier, Philremus	587	nomia	566
orhignyi Guérin, Trigona	606	platycera Gerstaecker, [Osmia] Aretosmia	528
oribazi Radoszkowski, Macroglossa	506	[Osmia] Lithosmia	508
[Macroglossa] Macro-	566	plumata F. Smith, Anthoglossa	526
glossapis	566	plumata F. Smith, Ptilothrix	595
orientalis F. Smith, [Bombus] Orientalibombus	580	[Ptilothrix] Energoponus	547
osmioides Duce, [Halictus] Gastrohalictus	553	podager Vachal, [Halictus] Paragapostemon	583
ovatus Kirby, [Melitta] (Andrena) Taenian-	602	politula Cockerell, [Ctenoplectra] Cten-	542
drena	573	oplectrina	542
pacifica Ashmead, Micrandrena	573	polytrichus Cockerell, [Panurginus] Birk-	585
pallidus F. Smith, Osiris	580	mania	585
pamirus Skorikov, [Subterraneobombus] Ober-	570	pomorum Panzer, [Bremus] (Bombus) Poino-	589
tombus	583	bombus	589
pannonica Mocsary, [Dioxys] Paradoxys	574	[Bremus] (Bombus) Rhodo-	596
panurgoides Friese, Morawitzia	526	bombus	596
papaveris Latreille, [Apis] Anthocopa	553	pratensis Fourcroy, [Vespa] Cingulata	538
[Apis] Furcosmia	587	pratorum Linnaeus, [Apis] (Bremus) Prato-	589
[Apis] Phyllotoma	528	bombus	589
papaveris Lepeletier and Serville, Anthocopa	550	pratti Crawford, Sphecodosoma	601
pauana Meade-Waldo, Eupalacorchiza	553	pressus Frison, [Bremus] Pressibombus	590
paradoxa Friese, Fideia	553	producta Cresson, Alcidaea	523
paradoxa Friese, Leptoglossa	595	productus Cresson, [Philremus] Hoploproctus	578
[Leptoglossa] Ptolaglossa	501	productus Robertson, [Trypeta] Neotrypeta	604
paradoxa Friese, Prosopoides	501	pronitens Cockerell, Titusella	599
paradoxus Morawitz, [Halictoides] Cephalo-	535	propinqua Schenck, [Andrena] Simandrena	585
toides	528	prosopiformis Gribodo, [Melipona] (Trigona)	585
parallela F. Smith, [Megachile] Argyropile	578	Paratrigena	585
parvula Fabricius, [Apis] (Megilla) Nom-	560	prosopoides Duce, [Oediscelis] Prosopoides	501
oides	558	pruina F. Smith, [Megachile] Pseudocentron	593
parvula Holmberg, Hypochrotaenia	545	pruinosa Ashmead, Neolara	575
parvus Robertson, [Calliopsis] Heterosarus	520	pruinosa Say, [Macrocerus] Peponapis	588
pascoensis Mitchell, [Megachile] Derotropis	575	psacynithoides Brèthes, Eulouchopria	550
passiflorae Robertson, Anthemurgus	554	pubescens F. Smith, Oestropsis	579
paulista Schrottky, Neochelynia	533	[Oestropsis] Gastropsis	554
pelagoides Cockerell, [Perdita] Glossoperdita	559	pugnatus Say, [Megachile] Ceratias	535
pendleburyi Cockerell, Calamelecta	559	[Megachile] Gnathocera	554
pentamera Cockerell, Hoplitella	559	[Megachile] Sayapis	508
[Hoplitella] Hoplitina	553	pulchella Jurine, [Andrena] Nomlioides	578
percyrae Holmberg, Leptometria	563	pulchella Robertson, [Andrena] Pterandrena	594
		pulchra Crawford, Townsendiella	605
		pulchra F. Smith, [Euglossa] Eufriesea	549
		[Euglossa] Eumorpha	550
		punctata Cameron, Stictonomia	601

	Page		Page
<i>punctata</i> Fabricius, [Apis] (Centris) Melecta.	570	<i>rufimanus</i> Robertson, [Magachille] Chelostomo-	
[Apis] (Centris) Sym-		ides	537
morpha	602	<i>rufipes</i> Ashmead, Zacaesta	608
<i>punctatus</i> Fabricius, [Epeolus] Philereus	587	<i>rufipes</i> Lepeletier, [Bombus] Rufipedibom-	
<i>punctatus</i> Schenck, [Pasites] Biastoides	530	bus	597
<i>punctipennis</i> Cresson, Coelioxoides	539	<i>rufiventris</i> Latrelle, Ammobates	524
<i>punctulissima</i> Kirby, [Apis] Ceraplastes	535	<i>rufobalteatum</i> Cameron, Protoanthidium	591
[Apis] Gymnus	555	<i>rufocerulea</i> Friese, Brachyglossa	531
[Apis] Gyrodroma	555	[Brachyglossa] Brachy-	
[Apis] Stelis	601	glossula	531
[Apis] Trachusa	605	<i>rufogastra</i> Lepeletier and Serville, Allodape ..	523
<i>punica</i> Gribodo, Didonia	546	<i>rufifrons</i> F. Smith, [Chelostoma] Chelosto-	
<i>purus</i> Say, [Halictus] Augochlora	529	moides	537
<i>pygmaeus</i> Friese, [Pasites] Pseudopasites	591	<i>rugosa</i> Robertson, [Andrena] Trachandrena ..	605
<i>pyrenaica</i> Lepeletier, Diphyis	546	<i>rupestris</i> Fabricius, [Apis] Apathus	527
<i>quadratus</i> Friese, [Rhophites] Pararhophites ..	585	[Apis] Psithyrus	594
<i>quadricincta</i> Fabricius, [Apis] Halictus	556	<i>rustica</i> Olivier, [Apis] Centris	535
<i>quadricornis</i> Hedicke, [Prosopis] Hoplopro-		[Apis] Epicharis	548
sopsis	559	<i>sabulosus</i> Reed, Liphanthus	565
<i>quadridentata</i> Cresson, [Osmia] Diceratosima ..	545	<i>salviae</i> Panzer, Lasius	563
<i>quadridentata</i> Linnaeus, [Apis] Coelioxys	539	<i>saxorum</i> Cockerell, Lithandrena	565
<i>quadrifasciata</i> Ashmead, Hoplonomia	559	<i>sayi</i> Cockerell, Dianthidium	545
<i>quadrifasciata</i> Villers, [Apis] (Anthophora)		<i>scatellata</i> Jurine, [Nomada] Crocisa	541
Amegilla	524	<i>schottii</i> Fabricius, [Nomada] Pasites	585
[Apis] (Podalirius) Alf-		[Nomada] Rhineta	596
kenella	523	<i>schrottkyi</i> Friese, Pachycentris	581
<i>quadrimaculata</i> Panzer, [Apis] Lasius	562	<i>schultzei</i> Friese, [Halictus] Patellapis	586
<i>quinquespinosa</i> Spinola, Rophites	597	<i>seituli</i> Cockerell, Ornopasites	580
<i>ralunensis</i> Friese, [Sphecodes] Callosphcodes ..	533	<i>seotti</i> Cockerell, [Sphecodes] (Eupetersia)	
<i>ranunculi</i> Robertson, [Sphecodes] Proteraner ..	591	Nesoeupetersia	576
<i>rapunculi</i> Lepeletier, Heriades	557	<i>scripta</i> Gerstaecker, Euglages	549
<i>rectangulata</i> Cockerell, Euryglossidia	551	<i>scutellaris</i> Fabricius, [Nomada] Crocisa	541
<i>reducta</i> Cockerell, Pelandrena	586	[Nomada] Crocissa	541
<i>renitantly</i> Saussure, Thrincoctoma	604	[Nomada] Thyreus	604
<i>retusa</i> Linnaeus, [Apis] Anthophora	527	<i>seladonius</i> Fabricius, [Apis] (Halictus) Sela-	
<i>rhodognatha</i> Cockerell, [Ashmeadiella] Chil-		donia	599
osima	537	<i>semipurpurea</i> Cockerell, [Euryglossa] Eury-	
<i>rhodura</i> Cockerell, [Megachille] Hackeriapis ..	556	glossina	551
<i>rhopalocera</i> Holmberg, Thyreothremma	604	<i>semirubra</i> Cockerell, [Heriades] Proteriades ..	591
<i>robbii</i> Crawford, [Halictus] Nesohalictus	576	<i>senex</i> Taschenberg, Meletoctoides	570
<i>robusta</i> Radoszkowski, [Cilissa] Pseudocilissa ..	593	<i>senex</i> Vollenhoven, [Bombus] Senexibombus ..	599
<i>robustus</i> F. Smith, [Bombus] (Alpigeno-		<i>separatus</i> Cresson, [Bombus] (Bremus) Separa-	
bombus) Robustobombus	597	tobombus	599
<i>rostrata</i> Friese, [Oediscelis] Pseudiscelis	593	<i>sericea</i> Christ, [Apis] (Andrena) Leucandrena ..	564
<i>rubi</i> Cockerell, [Stelis] (Chelynia) Melano-		<i>serotinum</i> Cockerell, Prosopistemon	591
stelis	569	<i>serrata</i> Friese, Bicrnelia	530
<i>rubicunda</i> Kirby [Melitta] Halictus	556	<i>serratulae</i> Panzer, Trachusa	605
<i>rubicundus</i> F. Smith, [Bombus] (Fervido-		<i>serriorme</i> Blüthgen, [Thrincoctoma] Nesoth-	
bombus) Rubicundobombus	597	rincostoma	576
<i>rubifloris</i> Cockerell, [Chelynia] Chelostomop-		<i>sexcinctus</i> Fabricius, [Hylaeus] Halictus	556
sis	537	<i>sexmaculata</i> Cockerell, [Perdita] Tetraperdita ..	604
[Chelynia] (Chelostomop-		<i>seyrigi</i> Blüthgen, Parathrincoctoma	585
sis) Raphidostoma	595	<i>sibiricus</i> Fabricius, [Apis] (Bombus) Sibir-	
<i>rubriventris</i> Spinola, Chilicola	537	cobombus	599
<i>rufa</i> Friese, Mermiglossa	572	<i>siculum</i> Spinola, [Anthidium] Rhodanthi-	
<i>rufa</i> Linnaeus, [Apis] Ceratosmia	536	dium	596
[Apis] Osmia	580	<i>signata</i> Panzer, [Spheg] Hylaeus	560
[Apis] (Osmia) Amblys	524	[Spheg] Prosopis	590 and 591
[Apis] (Osmia) Pachyosmia	541	<i>signatus</i> Latrelle, Hylaeus	560
<i>rufescens</i> Westwood, Alphaneura	523	<i>silvestrii</i> Friese, [Trigona] Friescomelitta	553
<i>ruficaudus</i> Michener, [Halictoides] Micralic-		<i>simillima</i> F. Smith, [Osmia] (Nothosmia)	
toides	573	Monilosmia	574
<i>ruficollis</i> Lepeletier, Macrocera	566	<i>simplex</i> Cresson, [Heriades] Robertsonella	597
<i>ruficornis</i> Linnaeus, [Apis] Nomada	577	<i>sinaitica</i> Alfken, Paracrocia	588
<i>ruficornis</i> Scovell, Nomada	577	<i>singularis</i> Linsley and Michener, Protopolus ..	591

	Page		Page
singularis Rayment, [Paracolletes] Lysicolletes.....	566	terrestris Linnaeus, [Apis] Bombus.....	581
sitkensis Nylander, [Bombus] Poecilobombus.....	589	[Apis] (Bombus) Leucobombus.....	564
sjoestedti Friese, [Megachile] Amegachile.....	524	[Apis] Bremus.....	532
smaragdina F. Smith, Thalestria.....	604	[Apis] (Bremus) Terrestrisbombus.....	603
smaragdula Fabricius, [Apis] (Megilla) Pithitis.....	588	testacea Klug, [Melipona] Partamona.....	585
somalica Magretti, [Nomioides] Cellariella.....	534	[Melipona] Patera.....	586
[Nomioides] (Cellariella) Cellaria.....	534	testaceicornis Lepelletier, [Melipona] Nannotrigona.....	575
soroceensis Fabricius, [Apis] (Bombus) Soroceensibombus.....	600	texana Cresson, [Nomada] Cephen.....	535
[Apis] Kallobombus.....	561	texana Cresson, [Sphecodes] (Parasphecodes) Sphecodogastra.....	600
sphaerocephala Schrottky, Micraugochlora.....	573	thomasi Cockerell, Austrodioxys.....	530
spiloptera Cockerell, [Colletes] Ptilopoda.....	594	thoracica Cresson, [Melecta] Bombomelecta.....	581
spiniferus Viereck, Cryptohalictoides.....	541	thoracica Fabricius, [Apis] (Andrena) Gymnandrena.....	555
spinolae Cockerell, [Augochlora] Augochloropsis.....	529	thoracica Friese, Biglossa.....	530
[Augochlora] Paraugochlora.....	585	tibetanus Morawitz, [Apathus] (Psithyrus) Eopsithyrus.....	547
spinolae Dalla Torre, [Colletes] Lonchopria.....	585	tibialis Kirby, [Melitta] (Andrena) Plastandrena.....	588
spinulosa Kirby, [Apis] Hoplosmia.....	559	timberlakei Cockerell, Xeralictus.....	607
spiralis Olivier, [Andrena] Systropha.....	602	timberlakei Linsley, Triopasites.....	606
splendida Fabricius, [Apis] (Xylocopa) Acanthopus.....	521	timberlakei Michener, [Ashmeadiella] Arogochila.....	528
standingeri Gribodo, [Trigona] Dactylurina.....	544	tintinnans Holmberg, Eclectica.....	547
steloides Bingham, [Megachile] Protanthidium.....	591	tituli Cockerell, [Ceratina] Crewella.....	541
steloides Gay, [Anthidium] Notanthidium.....	578	tomentosus Eversmann, [Hylaeus] (Halictus) Monilapis.....	574
stehelides Spinola, [Anthidium] Notanthidium.....	578	torrida Westwood, Mesotrichia.....	573
stehna Schrottky, [Augochloropsis] Pseudaugochloropsis.....	593	torridum F. Smith, [Halictus] (Thrinchosoma) Eothrinchosoma.....	548
strenuus Holmberg, Energoponus.....	547	tranquebarica Fabricius, [Bombus] (Xylocopa) Nyctotomelitta.....	579
striatulus Cockerell, Heriadopsis.....	557	triangulifera Vachal, [Nomia] Epinomia.....	549
strigatum Panzer, [Trachusa] (Anthidium) Anthidellum.....	526	tricarinatus Bingham, [Megachile] (Heriades) Noteriades.....	578
[Trachusa] (Anthidium) Cerianthidium.....	536	trichothalmus Cameron, Caenohalictus.....	532
stygius Robertson, [Sphecodes] Machaeris.....	566	tricincta Kirby, Melitta.....	571
subignita Cockerell, [Augochlora] Augochloropsis.....	529	[Melitta] Cilissa.....	538
subterraneus Linnaeus, [Apis] (Bremus) Subterraneobombus.....	602	[Melitta] Kirbya.....	561
succincta Linnaeus, [Apis] Colletes.....	540	tricingulum Curtis, Lasloglossum.....	562
[Apis] (Colletes) Evodia.....	552	tricornis Radoszkowski, [Bombus] (Agrobombus) Tricornibombus.....	606
succincta Panzer, Nomada.....	577	tricornis Latreille, Osmia.....	580
succini Tosi, Meliponorytes.....	570	tridentata Dufour and Perris, [Osmia] Tridentosmia.....	606
superba Cresson, [Nomada] Holonomada.....	558	trifasciatum Spinola, [Camptopoeum] Acamptopoeum.....	521
superba Hoffmannsegg, Plusia.....	588	trimmerana Kirby, [Melitta] (Andrena) Hoplandrena.....	559
superba F. Smith, Megacilissa.....	567	triodonta Cockerell, [Osmia] Atoposmia.....	529
swammerdamella Kirby, [Melitta] Dasypoda.....	544	truncata Nylander, [Nomada] Melittoxena.....	572
sylvorum Linnaeus, [Apis] Thoracobombus.....	604	truncatum F. Smith, [Anthidium] (Pachyanthidium) Micranthidium.....	573
taclobanensis Cockerell, [Halictus] Homalictus.....	559	truncorum Fabricius, [Anthophora] Heriades.....	557
tandilensis Holmberg, Melissoptila.....	571	truncorum Linnaeus, [Apis] Heriades.....	557
tanguticus Morawitz, [Bombus] Tanguticobombus.....	603	[Apis] (Heriades) Trypeta.....	607
tarsata Spinola, [Tetralonia] Habrophora.....	556	trypetinum Robertson, Stelidium.....	601
[Tetralonia] Habropoda.....	556	turnerac Ducke, [Callopsiis] Protomelitturga.....	592
taurea Say, [Anthophora] Entechnia.....	547	umbaculata Fabricius, [Centris] Epicharis.....	548
tegularis Cockerell, Afrostelis.....	522	ursina Gmelin, [Apis] Panurgus.....	582
tejonensis Cresson, [Ceratina] Zadontomerus.....	608	ursinus Haliday, Ancyloscelus.....	525
terminalis Cresson, [Anthophora] Cilsodon.....	539	ussuriana Popov, [Ctenoplectra] Paramacropis.....	583
terminata F. Smith, [Tetralonia] Thygater.....	604		
terrestris Fabricius, [Apis] Bombus.....	531		

	Page		Page
vallorum Cockerell, [Podalirius] Antho-		victoriae Cockerell, [Gastropsis] Melitribus..	571
phoroides.....	527	vidua F. Smith, [Megachile] Delomegachile...	544
vandeveldeii Meunier, Stellenigris.....	601	vigilans Cockerell, Philoremulus.....	587
variabilis Friese, [Nomia] Reopenia.....	595	villosa Schenck, [Megachile] Arctosmia.....	528
variegata Fabricius, [Mellinus] (Prosopis)		[Megachile] (Osmia) Lithos-	
Navicularia.....	575	mia.....	565
variegata Fabricius, [Nomada] Epeolus.....	548	violacea Fabricius, [Xylocopa] Xilocopa.....	608
variegata Linnaeus, [Apis] Epeolus.....	548	violacea Linnaeus, [Apis] Xilocopa.....	608
variegata Morawitz, Epimethea.....	548	violaceipennis Cameron, Melanapis.....	569
variegata Olivier, [Andrena] (Nomlodes)		violae Robertson, [Andrena] Iomolissa.....	561
Eunomioides.....	550	viperinus Holmberg, [Epeolus] Calospiloma...	533
variegata F. Smith, [Allodape] Allodapula ...	523	[Epeolus] Palnepeolus..	582
variolosa Cresson, [Megachile] (Heriades)		viride Perty, Cnemidium.....	539
Neotrypeta.....	576	viridiceps Cockerell, Ctenoplectrella.....	542
variolosa Holmberg, Trophocleptria.....	606	volucelloides Gribodo, [Bombus] Volucello-	
velutina Lepeletier and Serville, [Mesocheira]		bombus.....	607
Hopliphora.....	559	vulgaris Schenck, Dufourea.....	547
[Mesocheira]		wellmanni Cockerell, Gronoceras.....	555
(Hopliphora)		williamsi Bridwell, Gnathylaeus.....	555
Oxyneidys..	580	wilmattae Cockerell, Xeromelissa.....	608
venustus F. Smith, [Lamprocolletes] Tricho-		xanthogaster Alfken, Rhopalomelissa.....	596
colletes.....	605	xanthopoda Cockerell, [Prosopis] Gnatho-	
verbenae Cockerell and Porter, [Callopsis]		prosopis.....	554
Verbenapis.....	607	xanthopus Kirby, [Melitta] Lasloglossum...	562
vernalis Philippi, Oediscelis.....	579	xenomastax Michener, [Ashmeadiella] Cub-	
vernoniae Schrottky, Ctenocorynura.....	542	itognatha.....	543
versatilis Bridwell, Mimulapis.....	574	xylocopoides F. Smith, [Megachile] Melanos-	
versicolor Fabricius, [Apis] (Centris) Cyano-		arus.....	560
centris.....	543	zapoteca Cresson, [Megachile] Cressoniella...	541
vestita Provancher, [Andrena] Platandrena..	588	zabrata Cresson, [Perdita] Neoperdita.....	576
viator Cockerell, Melissina.....	570	zonalis Cresson, [Perdita] Nomadopsis.....	577



INDEX

(New genera, species, etc., are printed in *italics*)

- abbottil, *Camptotypus*, 285.
 Erythropimpha, 285.
Abcrana, subg., 157, 159, 160.
Abda, 521, 526.
 abdominalis, *Euaspiis*, 546.
 Lipotriches, 565.
 Phileremus, 525, 582, 587.
 Thynnus, 546, 549.
 aberrans, *Nothylaenus* (*Anylaeus*), 527.
Abies balsamea, 46.
 religiosa, 213.
 ablables, *Barbus*, 318, 326.
 Puntius (*Barbodes*), 326.
Ablerus, 47.
 perspicuosus, 47.
 abnormis, *Stelis*, 579.
Abrupta, 521.
abrupta, *Anthophora*, 569.
abyssorum, *Lumbrineris*, 117.
Acamptopoeum, 521.
Acanthalictus, 521.
acanthinus, *Sceloporus*, 355.
 Sceloporus malachiticus, 356.
 Sceloporus melanorhinus, 351.
Acanthocopa, 553.
Acanthophora, 563.
Acanthopus, 521, 541.
 goryi, 541, 571.
Acanthosmia, 522.
Acanthosmioides, 522.
Acanthosmioides, 522.
Acentron, 522.
Aceratosmia, 522.
Acerina zillii, 344.
acervorum, *Apis*, 527, 568, 589.
achilleae, *Neaspilota*, 19.
aciculatus, *Phloeosinus*, 406, 458, 459,
 472, 473, 474.
actinobola, *Trypanea*, 4, 6 (fig.), 13,
 15, 16, 17.
 Trypeta, 16.
Actinospermum, 16.
aciferus, *Halicetus* (*Oxyhalictus*), 580.
acuminata, *Eupholoe*, 101, 108, 109.
Acunomia, 522.
acuta, *Lumbriconereis*, 102, 114.
 Lumbrineris, 102, 114, 115 (fig.).
acutus, *Pityophthorus*, 218.
Adenostoma, 61.
adpersus, *Gerrhonotus imbricatus*, 365,
 368.
adunca, *Anthophora*, 559.
 Apis, 542, 559.
adventor, *Agrobombus* (*Adventoribom-*
 bus), 522.
Adventoribombus, 522.
Aelurodon, 484.
Aenocyon dirus, 484.
aequifasciata, *Oxyrhopus doliatus*, 393.
aequipunctatus, *Lispinus* (*Lispinus*), 90.
aethiops, *Lispinus*, 89.
 Panurgus, 594.
 Pseudolispinodes, 82.
 Pseudolispinodes (*Liberiella*), 89.
afer, *Notopterus*, 306.
africana, *Megachile*, 530.
 Megachile (*Berna*), 530.
africaniba, *Megachile*, 530.
Afrostellis, 522.
 tegularis, 522.
affoniae, *Stegomastodon*, 512.
agamemnon, *Papilio*, 43.
Agapostemon, 522.
 arenarius, 592.
ageratae, *Trupanea*, 8.
 Trypanea, 3, 6 (fig.), 8.
Ageratum littorale, 8.
agilis, *Armandia*, 102, 121 (fig.), 129.
 Ophellina, 102, 129.
Aglaa, 522.
Aglae, 522.
 coerulea, 522.
Aglaeopsis, 522.
 brevipennis, 522.
Agonocryptus, 279.
Agriocharis sp., 479.
Agrobombus, 522, 523, 561, 606.
 (*Adventoribombus*) *adventor*, 522.
 (*Laesobombus*) *laesus*, 561.
 (*Tricornibombus*) *tricornis*, 606.
agrorum, *Apis*, 523, 532.
 Bombus, 523.
Akleistops guatemalensis, 380.
alaskanus, *Phloeosinus*, 400, 409, 472,
 474.
alba, *Eclipta*, 9.
 Lepidasthenia, 102, 103.
 Neaspilota, 19.
 Polynoë, 102, 103.
 Trypanea 9.
albata, *Melissodes*, 607.
albicincta, *Zonopimpla*, 283, 284.
albicinctus, *Eplurus*, 284.
albicostella, *Filatima*, 272.
albidipennis, *Neaspilota*, 19.

- albifrons, *Chelostoma*, 574.
 Monumetha, 574.
 albilabris, *Hylaeus*, 536, 539.
 albitarsis, *Megachile*, 522.
 Polyglossa, 589.
 albiventris, *Osmia*, 564.
 albocuneata, *Euryglossa*, 593.
 albopictus, *Isepeolus*, 561.
 albopilosus, *Andrena*?, 599.
 Panurginus, 599.
 alboplagiatus, *Luperodes*, 58.
 albopunctata, *Apis*, 525.
 albosparsa, *Granida*, 172, 175.
 albotibialis, *Brachymeria*, 42.
 albovittata, *Perdita*, 586.
 Alcidae, 523.
 producta, 523.
 Alestes, 315.
 longipinnis, 312, 315.
 (*Brachyalestes*) *longipinnis*, 315.
 macrolepidotus, 316.
 (*Brycinus*) *macrolepidotus*, 316.
 nurse, 312, 316.
 rutilus, 312, 316.
 alfaroi, *Gerrhonotus*, 364.
 Alfkenella, 523, 524.
 alfkeni, *Anthrenoides*, 527.
 Allodapa, 523.
 Allodape, 523.
 candida, 566.
 rufogastra, 523.
 variegata, 523.
 Allodapula, 523.
 Alloperdita, 523.
 Allopsithyrus, 523.
 Alloscirtetica, 523, 558, 576, 598.
 Allotheronia, 288.
 12-guttata, 288.
 Alloxylocopa, 523.
 alni, *Pityophthorus*, 209.
 Alnus sp., 210.
 Alphaneura, 523, 527.
 rufescens, 523.
 Alphenobombus, 524, 539, 553, 567, 597.
 (*Coccineobombus*) *coccineus*, 539.
 (*Fraternobombus*) *fraternus*, 553.
 (*Funebriobombus*) *funnebris*, 553.
 robustus, 597.
 alpigenus, *Bombus*, 524.
 Alpinobombus, 524.
 alpinum, *Anthidium*, 593.
 alpinus, *Apis*, 524.
 Bremus, 524.
 altipinnis, *Eutropius*, 331.
 amabilis, *Ceratina*, 533.
 Amalthea, 524, 606.
 amalthea, *Apis*, 524, 606.
 Trigona, 45.
 Amaurocosmia, 524.
 amazonicus, *Neodryocoetes*, 181.
 ambigua, *Spilogale*, 502, 503.
 Squilla, 56.
 ambiguus, *Epeoloides*, 548.
 Amblyapis, 524.
 Amblys, 524, 536, 580, 581.
 Amegachile, 524.
 Amegilla, 523, 524.
 American flies of the family Trypetidae, notes on, 1.
 americana, *Antilocapra*, 497.
 Nomada, 578.
 Persea, 179.
 Tanupolama, 516.
 americanorum, *Ptilotopus*, 595.
 amethystina, *Apis*, 577.
 Ammobates, 524, 532.
 bicolor, 524, 525.
 (*Caesarea*) *depressa*, 532.
 dichroa, 574, 580.
 rufiventris, 524.
 Ammobatoides, 525, 582, 587.
 Ammotrypane, 128.
 aulogaster, 101, 128, 130 (fig.).
 fimbriata, 101, 128.
 limacina, 130.
 ampelas, *Ficus*, 43.
 Amphilius, 332.
 pictus, 328, 332.
 Anabas, 345.
 kingsleyae, 345.
 Anabatidae, 345.
 Anabernicula minuscula, 479.
 anabrivorus, *Ooencyrtus*, 49.
 Anabrus simplex, 51.
 Anacamptis populella, 267.
 Analtides, 109, 110.
 benedeni, 110.
 catenula, 102, 105 (fig.), 109.
 analis, *Macrocera*, 566.
 analis, *Tetralonia*, 566.
 Anancus bensonsensis, 493.
 Ancaeus, 85, 88.
 exiguus, 90.
 megacephalus, 88, 90.
 nitidissimus, 90.
 polltus, 90.
 prolixus, 90.
 anceps, *Pityophthorus*, 205.
 Ancyla, 525, 588.
 oraniensis, 525, 588.
 Ancylandrena, 525.
 Ancylyloncha, 157, 159, 164, 172.
 diomphalia, 173, 174.
 mindanaoana, 165, 173, 175.
 morosa, 173, 174.
 titanis, 173, 175.
 Ancylosceles ursinus, 525.
 Ancyloscelis, 525, 603.
 armatus, 546.
 Ancyloscelus, 525.
 Andineta, 525.
 andium, *Cordillerion*, 493.
 Andrena, 519, 522, 525, 527, 534, 537, 538, 540, 543, 549, 555, 559, 563, 564, 568, 569, 578, 588, 589, 595, 598, 599, 602, 606, 608.
 albopilosus, 599.
 aulica, 598.
 australis, 572.
 bicolor, 549.
 bradleyi, 540.
 chalybeata, 562.

- Andrena cineraria*, 525.
cornuta, 565.
cressonii, 580.
curvipes, 577, 578.
curvungula, 563.
 (Megandrena) *encellae*, 568.
erberi, 534.
erigeniae, 594.
 (Scrapteropsis) *fenningeri*, 599.
flavipes, 608.
fragilis, 606.
 (Campylogaster) *fulvo-crustatus*, 534.
funebrils, 525.
haemorrhoidalis, 538.
halictoides, 576.
hatterflana, 537.
 (Ancylandrena) *heterodoxa*, 525.
hirtipes, 544, 589.
humilis, 538.
labialis, 558.
labiata, 589.
lagopus, 599.
lobata, 549, 582.
 (Dactylandrena) *maura*, 543.
maurula, 591.
 (Micrandrena) *melanochroa*, 573.
melittoides, 571.
minutula, 525.
modesta, 530.
morio, 569.
nasoni, 588.
nigriceps, 539.
nitidiuscula, 578.
ovacula, 602.
peringueyi, 595.
 (Gonandrena) *persimulata*, 555.
propinqua, 599.
pulchella, 578, 594.
rugosa, 605.
sericea, 564.
spiralis, 602.
thoracica, 555.
tibialis, 588.
trimmerana, 559.
variegata, 550.
vestita, 588.
violae, 561.
Andrenella, 525.
andreniformis, Calliopsis, 533.
andrenoides, Birkmanla, 531.
Osmia, 549.
Panurgus, 584.
Andrenopsis, 525.
flavorufus, 525.
Androgynella, 525.
Aneucamptus, 88.
excelsicollis, 88.
angolensis, Clarias, 327, 329, 330.
Anguillidae, 306.
angustissimus, Espeson (Parespeson), 88.
angustus, Fells, 505.
Anhylaeus, 527.
 Annelid worms in the United States
 National Museum, identity of, 101.
annularis, Melitta, 562.
Prosopis, 562.
annulata, Apis, 560, 586, 606.
Prosopis, 560, 586, 606.
anomala, Pseudapis, 592.
anomalus, Cyrtapis, 543.
Hallictus, 545.
anonymorpha, Uta bicarinata, 361.
Anoxia, 164.
matutinalis suturalis, 174.
orientalis, 164.
pilosa, 164, 174.
villosa, 164.
antarctica, Scirtetica, 523, 558, 576, 598.
antanges, Gerrhonotus, 364, 369.
antennariae, Sphecodes, 545.
antennata, Eucera, 566, 603.
antennatus, Phloeosinus, 401, 415, 417, 419, 472, 474.
Anthedon, 521, 526.
Anthemois, 543, 567.
Athidiellum, 536.
Anthidium, 545, 581, 582, 584, 590, 593.
alpinum, 593.
bicolor, 581.
bivittatum, 579.
curvatum, 545.
dorsale, 557.
flavomarginatum, 560.
illustre, 533.
laticeps, 528.
nasutum, 601.
oblongatum, 590.
perpectum, 584.
siculum, 596.
steloides, 578.
strigatum, 536.
truncatum, 573.
Anthocopa, 587, 594.
Anthomoessa, 569.
anthonyi, Peromyscus eremicus, 489.
Anthophila pariana, 275.
Anthophora, 520, 527, 549, 563, 573, 589.
abrupta, 569.
adunca, 559.
aurulentocaudata, 572.
bicornis, 580.
conica, 539.
 (Micranthophora) *curta*, 573.
floridana, 547.
 (Eucara) *laticeps*, 549.
quadrifasciata, 524.
taurea, 547.
terminalis, 539.
truncorum, 557.
Anthophorites, 527.
mellona, 527.
Anthophoroides, 527.
Anthophorula, 527, 562, 598.
compactula, 527.
Anthrena, 525, 527.
Anthrenoides, 527.
alfkeni, 527.
Anthrophorula, 545.
Antilocapra americana, 497.
antipodes, Sphecodes, 531.
antiqua, Aplaria, 527.

- antiquorum, Libellulapis, 564.
 Anylaeus, 527.
 aonidum, Chrysomphalus, 47.
 Apathus, 527, 594.
 ashtoni, 528.
 fraternus, 553.
 tibetanus, 547.
 Aphalictus, 527.
 Aphaneura, 523, 527.
 Aphelinidae, 47.
 Aphyosemion, 335.
 calliurus, 334, 336.
 castaneum, 335.
 liberlensis, 334, 335.
 Apiaria, 527.
 antiqua, 527.
 Apiarus, 528.
 apicalis, Clemora, 172, 174.
 Cnemora, 167.
 Epimecoideus, 282.
 Lithurgus, 565.
 Phytalus, 160.
 apicata, Coelioxys, 564.
 apiformis, Corbicula, 534, 540.
 Apis, 519, 523, 602.
 acervorum, 527, 568, 589.
 adunca, 542, 559.
 agrorum, 523, 532.
 albopunctata, 525.
 alpinus, 524.
 amalthaea, 524, 606.
 amethystina, 577.
 annulata, 560, 586, 606.
 argentata, 551, 583.
 aterrima, 535, 555, 601, 605.
 aurulenta, 556.
 banksiana, 582.
 barbutellus, 523.
 bicornis, 524, 536, 580.
 bimaculata, 556, 598.
 bombylans, 563.
 (Ancyloscellis) brasiliensis, 525.
 byssina, 546, 605.
 calcarata, 549, 582.
 calendarum, 552.
 campanularum, 557.
 campestris, 573.
 (Andrena) carbonaria, 554.
 centuncularis, 567.
 clineraria, 525.
 coecutiens, 548.
 conica, 539.
 cordata, 539, 550.
 cucurbitina, 536, 539.
 cullumanus, 543.
 dentata, 533, 538, 552.
 dimidiata, 535, 550.
 dorsata, 568.
 fabriciana, 577.
 favosa, 570.
 (Andrena) femoralis, 522.
 fenestrata, 530, 542.
 fervidus, 553.
 floreana, 573.
 florisomnis, 537, 557.
 fulviventrtris, 537.
 Apis griseocollis, 599.
 haemorrhoidalis, 557.
 helvola, 525.
 (Synapis) henshawii, 602.
 hirtipes, 535, 548.
 hortorum, 559.
 hypnorum, 595.
 interrupta, 582.
 ireos, 584.
 lapidarius, 569.
 latipes, 529, 588.
 (Melissodes) leprieuri, 571.
 longicornis, 549.
 malvae, 566, 603.
 maxillosa, 537.
 melliponoides, 547.
 mellifica, 523.
 minutissima, 578.
 muraria, 537, 567.
 muscaria, 563.
 muscorum, 538.
 nitida, 525.
 papaveris, 553, 587.
 parvula, 578.
 pilipes, 527, 589.
 pratorum, 589.
 punctata, 570, 602.
 punctulatissima, 535, 555, 601, 605.
 quadriceincta, 556.
 quadridentata, 539.
 quadrifasciatus, 523.
 quadrinaculata, 562.
 retusa, 527.
 rufa, 524, 536, 580, 581.
 ruficornis, 577.
 rupestris, 527, 594.
 rustica, 535, 543.
 seladonius, 599.
 sericea, 564.
 sibiricus, 599.
 smaragdula, 588.
 soroeensis, 561, 600.
 spinulosa, 559.
 splendida, 521.
 subterraneus, 602.
 succincta, 540, 552.
 sylvorum, 604.
 terrestris, 531, 532, 564, 608.
 thoracica, 555.
 truncorum, 557, 607.
 ursina, 582.
 variegata, 548.
 versicolor, 543.
 villosa, 528, 565.
 violacea, 608.
 Apista, 528, 547.
 opalina, 528, 547.
 Aplocheilus, 337.
 spilauchen, 337.
 Apogonia, 163, 172, 173.
 cribricollis, 163, 172, 173.
 cupreoviridis, 163, 172, 173.
 cuprescens, 163.
 villosella, 163, 172, 173.
 appendiculata, Xylocopa, 523.

- Apterygota**, new neotropical insects, of family *Japygidae*, 291.
- apuleiae**, *Spermophthorus*, 204.
- Arabella**, 124, 125.
 geniculata, 125.
 iricolor, 102, 124.
 iridescens, 101, 123, 124.
 sp., 120.
 zonata, 102, 125.
- Archianthidium**, 528.
- Archimegachile**, 528.
- arcticus**, *Galeocerdo*, 25, 28.
- Arctosmia**, 528, 585.
- arcuatus**, *Hallictus*, 552.
- arenae**, *Phyllodoce*, 102, 109, 110.
- arenarius**, *Agapostemon*, 592.
- argentata**, *Apis*, 551, 583.
- argentifrons**, *Monumetha*, 574.
- argentina**, *Brachynomada*, 531.
 Psaenythia (*Parapsaenythia*), 584.
- argentinum**, *Callonychium*, 533.
- Argochila**, 528.
- Argyropile**, 528.
- Argyroselenis**, 528.
- Arhysosage**, 528.
 johnsoni, 528.
- arizonae**, *Benaenomys*, 481, 489, 490.
 Eligmodontia, 489, 490.
 Glyptotherium, 480, 482, 498.
 Spilogale, 502, 503.
 Stegomastodon, 481, 512.
- arizonense**, *Kinosternon*, 477, 479.
- arizonensis**, *Trypanea*, 5, 6 (fig.), 15.
- arizonica**, *Cupressus*, 402, 418, 422, 425, 440, 472, 473.
- arizonicus**, *Phloeosinus*, 402, 424, 472, 473.
- Arla**, 269.
 tenuicornis, 269.
- Armandia**, 129.
 agilis, 102, 121 (fig.), 129.
 maculata, 102, 129, 130 (fig.).
- armaticeps**, *Osmia*, 535.
- armatus**, *Ancyluscellis*, 546.
- Arnica cordifolia**, 268.
- arnicella**, *Gnornmioschema*, 268.
- arnoldi**, *Nomioides* (*Cellaria*), 534.
 Osmia (*Aspidosmia*), 529.
- Aroga rigidae**, 274.
 websteri, 273.
- articulata**, *Nomada*, 578.
 Sthenelais, 102, 107.
- Artifacts**, scored bone, of the central Great Plains, 91.
- Artiodactyla**, 495, 513.
- Asaropoda**, 528.
- Asclepiadaceae**, 178.
- ashmeadi**, *Calliephialtes*, 283.
 Zonopimpla, 283.
- Ashmeadiella**, 528, 541, 543.
 (*Corythochila*) *inyoensis*, 541.
 rhodognatha, 537.
 timberlakei, 528.
 (*Cubitognatha*) *xenomastax*, 543.
- Ashmead's genera of ichneumon-flies**, genotypes, 277.
- ashtoni**, *Apathus*, 528.
 Psithyrus, 528.
- Ashtonipsithyrus**, 528.
- asper**, *Sceloporus*, 351, 356.
- asperulus**, *Pseudopityophthorus*, 199.
- Aspidosmia**, 529.
- Aster**, 16.
- ater**, *Panurgus*, 582.
 Phileremus (*Melanempis*), 569.
- aterrima**, *Apis*, 535, 555, 601, 605.
 Megilla, 555.
 Stelis, 555.
- Athyreodon**, 288.
 atriventris, 288.
 thoracicus, 288.
- Atoposmia**, 529.
- atra**, *Centris*, 569.
 Ceylonicola, 536.
 Trachusa, 582.
- atripes**, *Melissodes*, 548.
- atriventris**, *Athyreodon*, 288.
- atrox**, *Fells*, 480, 505 (fig.).
- attenuatus**, *Lispinus*, 88.
 Lispinus (*Lispinus*), 90.
- attenuatus**, *Pityophthorus*, 222.
- auctor**, *Pityophthorus*, 214.
- Audinetia**, 529.
- Audinetia**, 525, 529, 588.
- Audouinea oculata**, 127.
- Audouinia filigera**, 127.
- Augochlora**, 529, 579, 581, 597, 603.
 gratiosa, 529.
 ignita, 529.
 muelleri, 579.
 (*Tetrachlora*) *multiplex*, 603.
 spinolae, 529, 585.
 (*Augochloropsis*) *subignita*, 529.
- Augochlorella**, 529.
- Augochloropsis**, 529, 585, 593.
 (*Paraugochloropsis*) *lycorias*, 585.
 sthena, 593.
- aulica**, *Andrena*, 598.
- aulogaster**, *Ammotrypane*, 101, 128, 130 (fig.).
- auratus**, *Pimelodus*, 331.
- aureolus**, *Sceloporus mucronatus*, 356.
- aureopilosa**, *Exomalopsis*, 552.
- auricomus**, *Bombias*, 531.
 Bombus, 577.
- Auricularia**, 529, 590, 591.
- aurifuscus**, *Chrysopheon*, 538.
- auritus**, *Gerrhonotus*, 364.
- aurulenta**, *Apis*, 556.
- aurulentocaudata**, *Anthophora*, 572.
- australensis**, *Neoceratina*, 575.
- australis**, *Andrena*, 572.
 Lachnus, 46.
- Austrandrena**, 530.
- Austrodioxys**, 530.
 thomasi, 530.
- Autochelostoma canadensis**, 530.
- Azotus silvestrii**, 47.
- azurea**, *Mesocheira*, 570, 573.
- Baana**, 530, 542.
- baileyi**, *Clella*, 391.

- Balomys*, 483, 509.
 brachygnathus, 480, 488, 489, 508.
 minimus, 480, 488.
 taylori, 488, 489, 508, 509.
bakeri, *Lispinus* (*Lispinus*), 90.
balsamea, *Abies*, 46.
Banchogastra, 288.
 nigra, 288.
banksiana, *Apis*, 582.
 Pinus, 408, 472, 474.
barbarus, *Periophthalmus*, 346.
Barbata, 530, 569.
barberi, *Mixojapyx*, 296.
Barbus, 320, 323.
 ablades, 318, 326.
 boboi, 301, 318, 325.
 camptacanthus liberiensis, 324.
 flomoi, 301, 317, 323.
 gambiensis, 322.
 spurrelli, 318, 326.
 trispilus, 318, 324.
barbutellus, *Apis*, 523.
barbutellus, *Psithyrus*, 523.
barda, *Phyllophaga*, 160.
barila, *Cyprinus*, 318.
Barilius, 318.
 engrauloides, 320.
 silex, 301, 347, 348.
 steindachneri, 320.
barrei, *Paracoelioxys*, 583.
basalis, *Parevaspis*, 585.
basizona, *Tetralonia*, 603.
Bathygobius, 347.
 soporator, 346, 347.
Batla lunaris, 274.
baumanni, *Phloeosinus*, 398, 404, 437, 438, 439, 472, 473.
beardsleyi, *Greeleyella*, 555.
beata, *Perdita*, 587.
beecheyi, *Citellus* (*Otospermophilus*), 485, 486.
Bees, the types species of the genera and subgenera, 519.
beesoni, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
Beetles, bark (*Pityophthorini*), new species from Mexico and Tropical America, 177.
 bark, revision of the genus *Phloeosinus* Chapuis in North America, 397.
 chrysomelid, *Luperodes bivittatus* (LeConte) and *varicornis* (LeConte) and some allied species, 57.
 related to *Phyllophaga* Harris, with descriptions of new genera and subgenera, 157.
 staphylinid, notes on the classification of the groups *Lispini* and *Oseriinae*, 75.
 West Indian melolonthine, descriptions of the larvae and a key to the known larvae of the tribe, 167.
bella, *Nomada*, 554.
Belone senegalensis, 302.
benedeni, *Anatitides*, 110.
bensonensis, *Anancus*, 493.
 Cordillerion, 481, 493.
bensonensis, *Sylvilagus*, 475, 481, 492 (fig.).
bensoni, *Citellus*, 480, 485, 506.
 Cratogeomys, 480, 487.
 Onychomys, 481, 489, 490, 509.
Bensonomys, 489.
 arizonae, 481, 489, 490.
benthami, *Cupressus*, 438, 467, 472, 473.
bequaerti, *Xerophasma*, 608.
Berna, 530.
beroni, *Oxyedys*, 580.
betheli, *Melanostelis*, 569.
Betheliella, 530.
 calocharti, 530.
Biareolina neglecta, 530.
Blastes, 530, 572, 596.
 brevicornis, 585.
Blastoides, 530.
bicarinata, *Uta bicarinata*, 361.
Bicolletes, 530.
 neotropica, 530.
bicolor, *Ammobates*, 524, 525.
 Andrena, 549.
 Anthidium, 581.
 Exoneura, 552.
 Lioastra, 564.
 Macrotera, 567.
 Melecta, 572.
 Mesochelra, 572.
 Rhathymus, 564, 595.
 Scapter, 599.
bicometes, *Diagonozus*, 545.
Bicornelia, 530.
 serrata, 530.
bicornis, *Anthophora*, 580.
 Apis, 524, 536, 580.
 Osmia, 524.
bidentata, *Sudila*, 536, 602.
bidsalis, *Heterobranchus*, 332.
bifasciata, *Metarhyssa*, 279, 280.
 Prosopis, 593.
bifasciatus, *Epiplatys*, 335, 337.
 Hylaesus (*Koptogaster*), 561.
 Prosopis, 561.
bifasciata, *Opisthorhyssa*, 279.
Biglossa, 530.
 thoracica, 530.
bilabiata, *Lumbriconereis*, 102, 120.
 Lumbrineris, 102, 120.
Biluna, 530.
bimaculata, *Apis*, 556, 598.
bimaculatus, *Hemichromis*, 338, 341, 342.
binghami, *Nomia* (*Meganomia*), 568.
Binghamiella, 531.
bipunctatus, *Epicharoides*, 548.
 Mellinus, 529, 560, 590, 591.
 Prosopis, 529.
Birkmania, 531.
 andrenoides, 531.
birmanus, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.

- bisetosa, Trypanea, 4, 5, 6 (fig.), 12.
 Urellia, 12.
 bistriatus, Iolossus, 81.
 Lispinodes, 80, 88, 90.
 Lispinus, 81, 83.
 Lispinus (*Spinilus*), 83, 84, 88, 90.
 Longispinus, 80.
 Pseudolispinodes, 80, 81, 90.
 bitorquata, Rhodine, 102, 132.
 bituberculata, Megachile, 524.
 Megalopta, 568.
 bivittata, Phyllobrotica, 59.
 bivittatum, Anthidium, 579.
 Stelis (*Odontostelis*), 579.
 bivittatus, Celestus, 374.
 Luperodes, 57, 58, 59, 61, 63.
 Luperus, 59.
 bizonata, Doeringiella, 546.
 Blackman, M. W., on new species of
 bark beetles (*Pityophthorini*)
 from Mexico and Tropical Amer-
 ica, 177.
 on revision of the scolytid genus
 Phloeosinus Chapuis in North
 America, 397.
 Blackwelder, Richard E., on notes on
 the classification of the staphylinid
 beetles of the groups *Lispini* and
Osorilinae, 75.
 Blake, Doris H., on the chrysomelid
 beetles *Luperodes bivittatus* (Le-
 Conte) and *varicornis* (LeConte) and
 some allied species, 57.
 Blepyrus, 41, 47.
 insularis, 47.
 saccharicola, 47.
 boboi, Barbus, 301, 318, 325.
 bocandei, Melipona, 570.
 bocourti, Gerrhonotus, 364, 369.
 boettcheri, Ischiopsaurus, 88.
 bolacoides, Phyllophaga, 160.
 Bombias, 531, 577.
 auricomus, 531.
 bombiformis, Gronoceras, 555.
 Megachile, 555.
 Melissodes, 547.
 Saropoda, 528.
 bombilans, Svastra, 602.
 bomboides, Xylocopa, 531.
 Bomboixylocopa, 531.
 Bombomelecta, 531.
 larreae, 608.
 Bombus, 531, 532, 538, 540, 543, 546,
 564, 559, 561, 567, 569, 579, 589,
 595, 596, 599, 600, 602, 603, 604.
 agrorum, 523.
 alpigenus, 524.
 auricomus, 577.
 (*Coccineobombus*) coccineus, 539.
 coerulea, 543.
 confusus, 540, 602.
 cullumanus, 543.
 diversus, 546.
 funebis, 553.
 hortorum, 559.
 hypnorum, 595.
 Bombyx kozlovi, 561.
 laboriosus, 561.
 laesus, 561.
 lapidarius, 562, 569.
 lefebvrei, 524.
 ligusticus, 567.
 mastrucatus, 524, 567.
 mendax, 572.
 mucidus, 574.
 nevadensis, 577.
 nymphae, 552.
 oberti, 579.
 orientalis, 580.
 pomorum, 589.
 robustus, 597.
 rubicundus, 597.
 rufipes, 597.
 senex, 599.
 separatus, 599.
 sibiricus, 599.
 sitkensis, 589.
 soroeensis, 600.
 tanguticus, 603.
 terrestris, 564.
 tranquebarica, 579.
 tricornis, 606.
 volucelloides, 607.
 Bombusoides, 531.
 mengel, 531.
 bombycina, Megachile, 550.
 bombylans, Apis, 563.
 Centris, 563.
 borealis, Petaloproctus tenuis, 131.
 Boreostracon floridanus, 499.
 rivipacis, 499.
 börneri, Compsomellissa, 540.
 Borolinus, 79.
 Bothrys, 88.
 personatus, 88.
 boueti, Typhlosyngranchus, 303.
 Böving, Adam G., on descriptions of the
 larvae of some West Indian melolon-
 thine beetles and a key to the known
 larvae of the tribe, 167.
 Brachyalestes longipinnis, 315.
 nurse, 316.
 Brachycephalapis, 531.
 brachycercum, Phrynosoma douglassii,
 362.
 Brachyglossa, 531.
 rufocaerulea, 531.
 Brachyglossula, 531, 585.
 brachygnathus, Balomys, 480, 488, 489,
 508.
 brachyistius, Marcusenius, 307, 310.
 Brachylagus, 492.
 Brachymelecta, 531.
 Brachymeria, 41, 42, 43.
 albotibialis, 42.
 discreta, 43, 44, 45.
 discretoidea, 44.
 euploaeae, 42.
 fonscolombi, 43.
 jambolana, 41.
 Brachynomada, 531.
 argentina, 531.

- Brachyostracon cylindricus*, 499.
mexicanus, 499.
Brachyprotoma, 503.
pristina, 503.
bradleyi, *Andrena*, 540.
Brahmina, 157.
coriacea, 172, 175.
Branchiommata circumspectum, 101, 133.
brasiliensis, *Apis* (*Ancyluscelis*), 525.
Friesea, 553, 583.
Monoeca, 574.
braunsi, *Meliturgula*, 572.
braunsiana, *Capicola*, 534.
Bremus, 531, 532, 590, 599.
alpinus, 524.
fasciatus, 532.
fervidus, 553.
nevadensis, 577.
pomorum, 589, 596.
(Pressibombus) pressus, 590.
separatus, 599.
subterraneus, 602.
terrestris, 603.
breviceps, *Eucera* (*Cubitalia*), 543.
Mormyrops, 307, 308.
brevicollis, *Diplotaxis*, 163, 173.
brevicornis, *Blastes*, 585.
Hylaeus, 544.
Prosopis, 544.
Tiphia, 530, 585, 596.
brevipennis, *Aglaoapis*, 522.
Protomelecta, 592.
brevis, *Megachile*, 565.
bribiensis, *Parasphecodes*, 527.
Brownea sp., 195.
browni, *Hypolagus*, 492.
brullei, *Scapter*, 599.
bruneri, *Caenonomada*, 532, 536.
Evalljapyx, 292.
bruneri, *Perditomorpha*, 587.
brunneistigma, *Neaspilota*, 19.
brunneus, *Luperodes*, 57, 58, 59, 67, 73.
Luperus, 67.
buccinus, *Hallictus*, 560.
bucephala, *Osmia*, 535.
buckhorni, *Phloeosinus*, 403, 432, 472, 474.
burnettii, *Gerrhonotus*, 365.
burschi, *Neodryocetes*, 181, 192.
büttikoferi, *Chromis*, 344.
Chrysichthys, 332.
Clarias, 327, 329, 330.
Ophichthys (*Sphagebranchus*), 306.
Paratilapia, 343.
Paratilapia (*Pelmatochromis*), 343.
Pelmatochromis, 339, 342, 343.
Polypterus, 304.
Tilapia, 340, 342, 344.
byssina, *Apis*, 546, 605.
caballus, *Equus*, 495, 513.
cacao, *Theobroma*, 184.
Cacosoma, 532, 575.
discolor, 532, 575.
cacuminatus, *Pityophthorus*, 218.
Cadeguala, 532.
caelator, *Pityophthorus*, 214.
Caenohalictus, 532.
trichiothalmus, 532.
Caenonomada, 532, 536.
bruneri, 532, 536.
Caenoprosopis, 532.
crabronina, 532.
caerulescens, *Pasiphae*, 585.
caeruleus, *Gerrhonotus*, 364, 365, 368.
Caesalpinia ferrea, 204.
melanocarpa, 204.
Caesalpinaceae, 178.
caesalpiniae, *Spermophthorus*, 203.
Caesarea, 532.
Cajanus sp., 187.
calcarata, *Apis*, 549, 582.
Samba, 597.
calendarum, *Apis*, 552.
Callendra, 533, 538, 552.
californica, *Melecta*, 570.
Melitta (*Brachycephalapis*), 531.
Potamilla, 102, 133.
californica, *Trypanea*, 4, 6, 17.
californicus, *Lepus*, 481, 511.
Lispinus, 90.
Luperodes, 58, 63, 64, 65.
Paralispinus, 90.
Callandrena, 533.
Callanthidium, 533.
Calleupetersia, 533.
Calliephialtes, 283.
ashmeadi, 283.
calligaster, *Sceloporus melanorhinus*, 360.
Calliopsis, 533, 607.
andreniformis, 533.
flavifrons, 553, 583.
parvus, 558.
turnerae, 592.
verbenae, 607.
Callirrhoe involucrata, 69.
calliurus, *Aphyosemion*, 334, 336.
Callobombus, 533, 561.
Calloceratina, 533.
Callomelecta, 533.
pendleburyi, 533.
Callomelitta, 533.
picta, 533.
Callonychium, 533.
argentinum, 533.
callops, *Hypomacrotera*, 560.
Callosphcodes, 533.
Callotetrarhynchus, 31.
lepidus, 31.
Calocerus, 76, 77, 78, 88.
cicatricosus, 88.
calocharti, *Betheliella*, 530.
Calospiloma, 533, 582.
Calyptapis, 533.
florissantensis, 533.
Camellid sp., 496, 513.
Camelops, 496, 497, 514.
hesternus, 496.
kansanus, 496.
sp., 514.
camia, *Neopasites*, 576.

- campanulae*, *Halictoides*, 583.
Oligotropus, 579.
Campanularia, 534, 584.
campanularum, *Apis*, 557.
campestris, *Apis*, 573.
Psithyrus, 573.
Camptopoeum, 534, 553, 564, 583.
flavifrons, 553.
hirsutulum, 564.
nomadoides, 601.
nomioides, 601.
trifasciatum, 521.
Camptotypus, 284, 285.
abbottii, 285.
sellatus, 285.
Campylogaster, 534.
canadensis, *Antochelostoma*, 530.
Osmia, 574.
Phloeosinus, 406, 463, 465, 466, 472, 473, 474.
Picea, 409, 411, 472, 474.
canaliculata, *Meroglossa*, 572.
candida, *Allodape*, 566.
Canephora, 534.
Canephorula, 534, 540.
Canid, sp., 484.
Canis edwardii, 475, 480, 499, 500 (fig.).
lupus, 501.
rufus, 500, 501.
canus, *Rhopilites*, 597.
capensis, *Omachtes*, 593.
capicola, *Omachtes*, 600.
Capicola, 534, 596.
braunsiana, 534.
(Rhinochaetula) cinctiventris, 596.
capillaris, *Cirriformia*, 101, 128.
capillatus, *Paracolletes* (*Heterocolletes*), 558.
Capromeryx, 497, 517.
furcifer, 517.
gidleyi, 481, 482, 517 (fig.).
carangus, *Caranx*, 303.
Caranx carangus, 303.
carbonaria, *Apis* (*Andrena*), 554.
Carcharias platyodon, 30.
Oarea subtilis, 41, 43.
caribaeus, *Neodryocoetes*, 181, 185, 186, 187.
carinata, *Ctenonomia*, 542.
Heriades, 588.
Scapter, 572, 600.
carnifex, *Omachtes*, 580.
Carnivora, 499.
castaneum, *Aphyosemion*, 335.
castaneus, *Lispinus*, 89.
Pseudolispinodes (*Pseudolispinodes*), 89.
Catajapyx neotropica, 293.
catena, *Lispinus* (*Lispinus*), 90.
catenula, *Anaitides*, 102, 105 (fig.), 109.
Phyllococe, 102, 109.
caudifasciatus, *Pelmatochromis*, 340, 344.
Caupolicana, 534, 567, 594.
fulvicollis, 567.
gayi, 534.
Caupolicana, 534.
cavus, *Dibrachys*, 45.
Pteromalus, 45.
ceanothi, *Raphidostoma*, 595.
cedrophilus, *Sylvilagus auduboni*, 492.
cedrosensis, *Gerrhonotus*, 365.
Celestus, 349, 369.
bivittatus, 374.
cyanochloris, 374.
enneagrammus, 370, 373, 374.
montanus, 374.
rozellae, 372, 374.
Cellaria, 534.
Cellariella, 534.
cembroides, *Pinus*, 211, 214, 215.
Cemolobus, 534.
cenchoa, *Imantodes*, 386.
Centrias, 534.
Centris, 520, 535, 543, 550, 557, 569, 589, 595, 596, 605.
atra, 560.
bombylans, 563.
clavipes, 603.
cornuta, 555, 558, 565, 596.
dasyopoda, 548.
dasyus, 548.
difformis, 555, 558, 596.
(Poecilocentris) fasciatella, 589.
haemorrhoidalis, 557.
hirtipes, 548.
longimana, 605.
muscaria, 563.
punctata, 570, 602.
umbraculata, 548.
versicolor, 543.
Centrodes, 535.
Centrosmia, 535.
centuncularis, *Apis*, 567.
Megachile, 567.
Cephalapis, 535.
cephalica, *Gnathocera*, 554.
Cephalictoides, 535.
cephalicus, *Halictus*, 583.
cephalopeltis, *Sphagebranchus*, 306.
Cephalosmia, 535.
cephalotes, *Halictus*, 583.
cephalus, *Mugil*, 302.
Cephen, 535.
Ceraplastes, 535, 555, 601.
Ceratias, 535, 554, 598.
Ceratina, 536, 538, 539, 588.
amabilis, 533.
(Chloroceratina) cyanura, 533.
hieroglyphica, 536.
tejonensis, 603.
(Crewella) titusi, 541.
Ceratiniidia, 536.
Ceratonia, sp., 187.
Ceratopsia, 524, 536, 580, 581.
Ceranthidium, 536.
Cestodes from Florida sharks, 25.
Ceylallictus, 536.
Ceylonicola, 536, 602.
atra, 536.
chacabucensis, *Tapinotaspis*, 603.
Chacoana, 532, 536.
melanoanthra, 536.
Chalcididae, 41.

- chalcidiformis*, *Idioprosopis*, 560.
Chalcidoidea, Descriptions of five new species, with notes on a few described species (*Hymenoptera*), 41.
Chalcis, 41, 42.
Chalcobombus, 536.
 humilis, 536.
Chalcosmia, 537, 555.
Chalepogenus, 537, 545.
 incertus, 537.
Chalicodoma, 537.
chalybaeus, *Diploglossus*, 370, 371.
 Panurgus, 545.
chalybea, *Otenoplectra*, 542.
chalybeata, *Andrena*, 562.
 Nomia, 584.
Chamaecyparis, 397.
 nootkatensis, 401, 404, 415, 441, 472, 473.
 thyoides, 453, 465, 472, 473.
chamaesarachae, *Perdita*, 554.
chamberlini, *Phloeosinus*, 407, 470, 472, 473.
Chandler, Asa C., on Some cestodes from Florida sharks, 25.
chandleri, *Crociaspidia*, 541.
chaperi, *Epiplatys*, 335, 338.
 Haplochilus, 338.
Characnidae, 301, 311.
Charitandrena, 537.
Chasolium, 88.
 ernestini, 88.
Chelostoma, 535, 537.
 albifrons, 574.
 (*Cephalapis*) *jacintanum*, 535.
 rugifrons, 537.
Chelostomoides, 537, 554, 579, 598.
Chelostomopsis, 537, 595.
 rufifloris, 595.
Chelynia, 537.
 labiata, 537.
 rubi, 569.
 rufifloris, 537.
 rufifloris, 595.
chichimeca, *Megachile*, 575.
chillensis, *Colletes*, 532.
 Herbstiella, 557, 561.
Chilicola, 537, 560.
 rubriventris, 537.
Chilosima, 537.
Chionodes loetac, 270.
 whitmanella, 271.
chiricahuahua, *Phloeosinus*, 444, 472, 473, 474.
chiricahuensis, *Luperodes*, 59, 71.
Chirodines, subg., 161, 162.
 zunilensis, 162.
Chiroptera, 497.
Chlaenobia, subg., 157, 161, 162.
Chlaenobia ciliatipes, 162.
Chlerogas, 538.
chlerogas, *Halictus*, 538.
Chone, 135.
 ecaadata, 102, 135 (fig.).
 infundibuliformis, 102, 136.
 mollis, 136.
Chloralictus, 538.
Chlorandrena, 538.
Chloroceratina, 538.
Chlorosmia fulgida, 538.
Chromis blittikoferi, 344.
 mossambicus, 345.
 niloticus, 344.
Chromobombus, 538.
chrysalis, *Sphinx*, 279.
Chrysantheda, 533, 538, 552.
 nitida, 533, 538.
Chrysichthys, 331.
 blittikoferi, 332.
 filamentosus, 328, 332.
 nigrodigitatus, 328, 332.
Chrysomelid beetles Luperodes bivittatus (LeConte) and *varicornis* (LeConte) and some allied species 57.
Chrysomphalus aonidium, 47.
Chrysopheon, 538.
 aurifuscus, 538.
Chrysopsis, 14.
 microcephala, 15.
cicatricosus, *Calocerus*, 88.
 Thoracophorus, 88.
Cichlidae, 338.
ciliaris, *Gerrhonotus levicollis*, 365, 368.
ciliatipes, *Chlaenobia*, 162.
ciliatus, *Ptyophthorus*, 211.
Cilissa, 538.
 robusta, 593.
 trilineata, 538.
cincta, *Trachusa*, 546.
cinctiventris, *Capicola* (*Rhinochaetula*) 596.
cineraria, *Andrena*, 525.
 Apis, 525.
cinerarius, *Plesioanurgus*, 588.
cinerea, *Neotoma*, 491.
Cingulata, 538.
cinnabarina, *Prodoxys*, 590.
circinata, *Nephthys*, 102, 113.
circumspectum, *Branchiommata*, 101, 133.
 Megalomma, 101, 133.
circumspiciens, *Hypsicomus*, 102, 133.
cirrata, *Eupholoe*, 101, 105, 106.
Cirratulidae, 126.
Cirratulus, 126.
 grandis, 101, 126.
 tenulis, 101, 126, 127, 128.
Cirriiformia, 127.
 capillaris, 101, 128.
 filigera, 101, 127.
cirsii, *Sabulicola*, 597.
Citellus, 506.
 (*Otospermophilus*) *beecheyi*, 485, 486.
 bensoni, 480, 485, 506.
 cochisei, 480, 505.
 eversmanni, 506.
 mexicanus, 506.
 tuitus, 506.
citri, *Cnemaraxis*, 174.
Cladocerapis, 539.
cladocerus, *Lamprocolletes*, 539.
Claremontiella, 539.

- Clarias*, 328.
 angolensis, 327, 329, 330.
 büttikoferi, 327, 329, 330.
 liberiensis, 327, 329, 330.
 salae, 326, 328.
Clarke, J. F. Gates, on notes and new species of Microlepidoptera from Washington State, 267.
Clavicera, 536, 539.
clavicornis, *Eucera*, 572.
Clavilispinus, 88.
clavipes, *Centris*, 603.
 Halictus (*Lucasius*), 565, 566.
claviventris, *Osmia*, 564.
clella, *Clella*, 394.
 Clella clella, 394.
Clella, 349, 391.
 baileyi, 391.
 clella, 394.
 clella clella, 394.
 clella immaculata, 394.
 pethola, 391, 393.
Clemora, 137, 159, 160, 167, 171, 172.
 apicalis, 172, 174.
 smithi, 167, 171, 172, 174.
Clisodon, 539.
Clupea senegalensis, 304.
Clupeidae, 304.
clypeata, *Formicapis*, 553.
Onemarachis, 157, 159, 160, 163, 165, 167, 171.
 citri, 174.
 dissimilis, 167, 170, 171, 174.
 neglecta, 167, 170, 174.
 portoricensis, 167, 170, 174.
 suturalis, 167, 170, 171, 174.
 vandinei, 167, 169, 170, 174.
Onemarachis, subg., 157, 159, 160.
Cnemidandrena, 539.
Cnemidium, 539, 550.
 viride, 539.
Cnemora apicalis, 167.
coarcticolis, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
Coccineobombus, 539.
coccineus, *Alpigenobombus* (*Coccineobombus*), 539.
 Bombus (*Coccineobombus*), 539.
cochisel, *Citellus*, 480, 505.
Cockerellia, 539.
Cockerellula, 539, 566.
coconinensis, *Procamelus*, 514.
coecutiens, *Apis*, 548.
 Epeoloides, 548.
Coelioxoides, 539.
 punctipennis, 539.
Coelioxys, 539, 582, 583.
 apicata, 564.
 decipiens, 564, 583.
 montandoni, 582.
coerulea, *Aglae*, 522.
 Bombus, 543.
 Xylocopa, 543.
coerulescens, *Mesonychium*, 573.
Colax, 540, 595.
Coleoptera, 57, 75, 157, 167, 177, 397.
Collinus, sp., 479.
collaris, *Xylocopa*, 608.
Colletes, 540, 544, 552, 589, 594, 595, 596.
 chilensis, 532.
 graeffei, 544.
 (*Pollcana*) *herbsti*, 589.
 (*Ptilopoda*) *maculipennis*, 594.
 nasutus, 596.
 occidentalis, 532.
 spinolae, 565.
Colletes spilloptera, 594.
Columba micula, 480.
columbianus, *Cryptoteryx*, 281.
 Neodryocoetes, 181, 183.
Colymbus sp., 479.
comatus, *Pityoborus*, 203.
combusta, *Gronoceras*, 546.
 Megachile, 546.
compactula, *Anthophorula*, 527.
Compsomelissa, 540.
Compsomelissa bürneri, 540.
compta, *Melissodes*, 521.
Conandrena, 540.
Conanthalictus, 540.
conanthi, *Halictus* (*Conanthalictus*), 540.
concaus, *Epeolus*, 606.
concinna, *Vespa*, 560.
concolor, *Conophis lineatus*, 395.
 Felis, 485.
condigna, *Melissodes*, 553.
confertus, *Pityophthorus*, 219.
confusa, *Xylocopa*, 551, 580.
Confusibombus, 540, 602.
confusus, *Bombus*, 540, 602.
conica, *Anthophora*, 539.
 Apis, 539.
conjuncta, *Osmia*, 545.
 Trypanea, 4, 6 (fig.), 12.
 Urellia, 12.
Conohalictoides, 540.
 lovelli, 540.
Conophis, 349, 394, 395.
 lineatus concolor, 395.
 lineatus dunni, 395.
 lineatus lineatus, 395.
 nevermanni, 394, 395.
 pulcher plagosus, 395.
 pulcher pulcher, 395.
 pulcher similis, 395.
 vittatus viduus, 395.
 vittatus vittatus, 395.
Conophthorus, 178, 199.
conspicuus, *Pachymelus*, 581.
contradicta, *Megalopta* (*Megaloptidia*), 568.
convexus, *Luperodes*, 59, 71.
Cooke, C. Wythe. (See under *Henderson and Cooke*.)
cooki, *Mixojapyx*, 295.
 Pseudolispinodes (*Liberiella*), 81, 86, 88, 89.
Coptorthosoma, 540, 561.
Coquillettapis, 540.
 melittoides, 540.

- coquilletti*, *Diadasiella*, 545.
Corbicula, 534, 540.
 apiformis, 534, 540.
cordata, *Apis*, 539, 560.
 Euglossa, 539, 550.
 Osmia, 607.
cordifolia, *Arnica*, 268.
Cordillerion, 493.
 andium, 493.
 benzonensis, 481, 493.
 edensis, 493.
Coreopsis, 16.
coriacea, *Brahmina*, 172, 175.
coriaceus, *Halictus*, 543.
cornigera, *Exomalopsis* (*Pachycerapis*), 581.
cornuta, *Andrena*, 565.
 Centris, 555, 558, 565, 596.
 Hylaeus, 521.
 Prosopis, 521.
cornutus, *Zalygus*, 608.
coronarius, *Pityophthorus*, 220.
coronatus, *Phlaeosinus*, 402, 416, 472.
corticinus, *Thoracophorus*, 88.
Corvus sp., 480.
Corynogaster, 540, 567.
Corynura, 540, 567, 596.
 (*Corynuropsis*) *darwini*, 540, 541.
 inflaticeps, 596.
Corynuroides, 540, 541.
Corynuropsis, 540, 541.
 inflaticeps, 596.
Corythochila, 541.
costalimai, *Pityophthorus*, 223.
cotesi, *Microtrichia*, 174.
courbaril, *Hymenaea*, 187.
crabronina, *Caenoprosopis*, 532.
crassicauda, *Evalljapyx*, 293.
crassicornis, *Glyptoma*, 88.
crassicornis, *Luperodes*, 59, 74.
crassipes, *Paracolletes*, 583.
crassus, *Pityophthorus*, 213.
Cratogeomys bensoni, 480, 487.
Creightonella, 541.
cressoni, *Halictus*, 538.
Cressoniella, 541.
cressoni, *Andrena*, 580.
 Sphecodium, 600.
Crewella, 541.
cribratus, *Metylaenus*, 573.
cribratus, *Pityophthorus*, 216.
cribricollis, *Apogonia*, 163, 172, 173.
cribosa, *Phyllophaga*, 161.
 Tostegoptera, 161, 162.
cricetorum, *Megachile*, 594.
crinita, *Polyphylla*, 175.
crinitissima, *Phyllophaga*, 159, 160.
Orinoglossa, 541.
 natalensis, 541.
Orinoid, *Rhopocrinus*, a new fossil in-
 adunate genus, 151.
crispus, *Thysanoccephalum*, 31.
cristagalli, *Erythrina*, 190.
cristariae, *Holmbergia*, 558.
cristata, *Megachile*, 594.
cristatus, *Hylesinus*, 443.
 Phlaeosinus, 398, 405, 433, 444, 445,
 446, 447, 472, 473.
Crocisa, 541, 604.
 ? *lata*, 549.
Crocisaspidia, 541.
 chandleri, 541.
Crocissa, 541, 604.
Crosica, 604.
Crotaphytus? sp., 479.
crucifer, *Neolispinus*, 88.
crucigera, *Monolepta*, 65, 66.
Crustacean, new stomatopod, from the
 west coast of Mexico, new, 53.
 phyllopod, a new species from the
 Southwestern short-grass prai-
 ries, 33.
Cryptohalictoides, 541.
 spiniferus, 541.
Cryptoteryx, 281.
 columbianus, 281.
Cryptus, 281, 282.
 formosus, 277.
 sphingis, 277.
Ctenioschelus, 541.
Ctenoapis, 542.
 lutea, 542.
Ctenocolletes, 542.
Ctenocorynura, 542.
 vernoniae, 542.
Ctenonomia, 542.
 carinata, 542.
Ctenoplectra, 542.
 chalybea, 542.
 (*Ctenoplectrina*) *polluta*, 542.
 ussurlana, 583.
Ctenoplectrella, 542.
 viridiceps, 542.
Ctenoplectrina, 542.
Ctenopoda, 530, 542.
Ctenopora kingsleyae, 345.
Ctenioschelus, 571.
 goryl, 571.
Ctenosmia, 542, 559.
cubensis, *Neodryocoetes*, 180, 181, 191.
Cubitalia, 543.
Cubitognatha, 543.
cucurbitina, *Apis*, 536, 539.
Cullumanobombus, 543.
cullumanus, *Apis*, 543.
 Bombus, 543.
Cupidilinus, 487.
 magnus, 487.
 nebraskensis, 487.
cupreochalybea, *Euryglossa*, 551.
cupreoviridis, *Apogonia*, 163, 172, 173.
cuprescens, *Apogonia*, 163.
cupressi, *Phlaeosinus*, 398, 404, 432, 437,
 440, 441, 472, 473, 474.
Cupressus, 397, 398, 401, 404, 405, 425,
 438, 446, 448, 467.
 arizonica, 402, 418, 422, 425, 446,
 472, 473.
 benthami, 438, 467, 472, 473.
 forbesii, 421, 472, 473.
 glabra, 446, 472, 473.

- Cupressus macrocarpa*, 444, 472, 473.
 sargentii, 402, 404, 419, 424, 439, 440, 473.
 sp. 404, 406, 444, 473.
curriel, Labeo, 317, 318.
curta, *Anthophora* (*Micranthophora*), 573.
curtipennis, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
Curtisapis, 543.
curtisi, *Sigmodon*, 481, 509, 510.
curvatum, *Anthidium*, 545.
curvatus, *Luperodes*, 59, 74.
curvicarinata, *Prosopis*, 544.
curvicornis, *Eucera*, 602.
curvipes, *Andrena*, 577, 578.
curvungula, *Andrena*, 563.
 Cushman, R. A., on the genotypes of some of Ashmead's genera of ichneumon-flies, 277.
cushmani, *Fillatima*, 273.
cuspidata, *Ensiliniana*, 547.
cuspidatus, *Pityophthorus*, 217.
Cyaneoderes, 543.
 fairchildi, 543.
Cyanocentris, 543.
cyanochloris, *Celestus*, 374.
cyanura, *Ceratina* (*Chloroceratina*), 538.
Cyathocera, 543.
Cyathocera nodicornis, 543.
Cyathocrinus? *municipalis*, 152.
Cychocheilichthys, 320.
Cyclura, 241, 242, 246, 254, 255, 258.
cylindricus, *Brachyostrecon*, 499.
Cynoglossus senegalensis, 303.
Cynomys, 506.
Cyphomellissa, 543.
 pernigra, 543.
Cyphopyga, 543.
Cyprinidae, 301, 317.
Cyprinodontidae, 301, 334.
Cyprinus barila, 318.
 niloticus, 318.
Cyrtapis, 543.
 anomalus, 543.
dacetopectera, *Trypanea*, 4, 5, 6 (fig.), 14, 15.
Dactylandrena, 543.
Dactylurina, 544.
Danaïs, 43.
darwini, *Corynura* (*Corynuropsis*), 540, 541.
Dasia, 370.
Dasiapis, 544.
 ochracea, 544.
Dasycolletes, 544.
 metallicus, 544.
Dasyglossa, 544, 580.
dasypoda, *Centris*, 548.
Dasypoda, 544, 589.
 lobata, 549, 582.
dasypus, *Centris*, 548.
Dasyrhynchus insignis, 25, 29 (fig.), 30.
davisi, *Luperodes*, 67.
debilis, *Gynnis*, 162.
Decadocrinus, 152.
decemilneata, *Polyphylla*, 175.
decipiens, *Coelioxys*, 564, 583.
decorata, *Oxystoglossa*, 581.
decurrens, *Libocedrus*, 401, 402, 405, 412, 416, 424, 426, 428, 429, 431, 432, 433, 450, 472, 473, 474.
deleoni, *Gnathotrichus*, 227.
 Myloborus, 201.
Phloeosinus, 405, 454, 472, 473.
delicata, *Heterapis*, 557.
deliciosus, *Mormyrops*, 307, 308.
Delomegachile, 544.
Demonax media, 133.
Dendroctonus graniger, 452.
 haagli, 452.
Dendrocyna eversa, 470.
dentata, *Apis*, 533, 538, 552.
 Euglossa, 552.
 Exaerete, 533, 538.
dentatus, *Hylesinus*, 452.
 Hylurgus, 452.
 Nodocolletes, 577.
 Phloeosinus, 405, 450, 451, 452, 404, 472, 473, 474.
Denticolletes, 544.
denticrus, *Rhineta*, 596.
denticulata, *Ophelia*, 102, 130.
denticulatus, *Scrapis*, 590.
Dentigera, 544, 560.
dentiventris, *Halticoides*, 556.
deppii, *Gerrhonotus*, 364, 367, 368.
depressa, *Ammobates* (*Caesarea*), 532.
Deranchylacus, 544.
Derotropis, 545.
 Descriptions of five new species of Chalcidoidea, with notes on a few described species (Hymenoptera), 41.
Desmotetrapedia, 537.
detersa, *Megachile*, 525.
diabolica, *Melissa*, 543.
diacantha, *Melceta*, 594.
Diadasia, 540, 545.
 nigrifrons, 540.
Diadasiella, 545.
 coquilletti, 545.
Diadectes, 243.
Diagonozus, 545.
 bicometes, 545.
Diallectus, 545.
Dialonia, 545.
Diaandrena, 545.
Dianthidium, 545, 578, 591, 596.
 sayi, 545.
Diaspis pentagona, 47.
Dibothriorhynchus, 30.
Dibrachys, 45.
 cavus, 45.
Diceratosima, 545.
Dichroa, 545, 600.
dichroa, *Ammobates*, 574, 580.
 Pasites, 574.
Didonia, 546.
Didonia punica, 546.
diegenis, *Luperodes*, 58, 60.

- Diepeolus*, 546.
Dieunomia, 546, 550.
difformis, *Centris*, 555, 558, 596.
 Scrapteroides, 599.
Digronoceras, 546.
diguetti, *Gerrhonotus*, 364.
diligens, *Lagobata*, 562.
Dilobopeltis, 546, 549.
 fuscipennis, 546.
dimidiata, *Apis*, 535, 550.
dimidiatus, *Pityophthorus*, 221.
diomphalia, *Ancylonycha*, 173, 174.
Dioxys pannonica, 583.
Dipedia, 546.
Diphaglossa, 532, 546.
 gayi, 546.
 occidentalis, 532.
Diphysis, 546, 605.
 pyrenalca, 546.
Diploglossus, 369, 370.
 chalybaeus, 370, 371.
 steindachneri, 370.
Diplobothrium, 28.
 springeri, 25, 26 (fig.), 28.
Diploopsis, 88.
 multicostata, 88.
Diplotaxis, 163, 173.
 brevicollis, 163, 173.
 sordida, 163, 173.
 tristis, 163.
Dipodomys, 486, 506.
 gidleyi, 480, 506, 507.
 ordii, 486.
 sp., 489, 507.
Dipsas cenchoa reticulata, 385.
 cenchoa rhombeata, 384.
 gemmistrata latistrata, 387.
 gracillima, 387.
 splendida, 388.
dirus, *Aenocyon*, 484.
discolor, *Cacosoma*, 532, 575.
discrepans, *Lanthanomelissa*, 562.
discreta, *Brachymeria*, 43, 44, 45.
discretoidea, *Brachymeria*, 44.
dissimilis, *Cnemarachis*, 167, 170, 171, 174.
distichum, *Taxodium*, 405, 451, 452, 473, 474.
distincta, *Osmla*, 578.
distinguendus, *Rhynchitoides*, 597.
diversipes, *Nomia*, 578.
diversipes, *Tetrapedia*, 604.
Diversobombus, 546.
diversus, *Bombus*, 546.
Doeringiella, 546.
 bizonata, 546.
Dolichocheile, 546.
 melittoides, 546.
dolosa, *Neaspilota*, 19, 20.
dontomasi, *Gaigela*, 374, 376, 377, 380.
dorotheae, *Streptocephalus*, 34, 35 (fig.), 38.
dorsale, *Anthidium*, 557.
dorsata, *Apis*, 568.
douglassii, *Phrynosoma*, 361, 362, 363.
Drepanium, 547.
Drilonereis, 118, 125.
 robusta, 102, 119 (fig.), 125.
Drymobius margaritiferus, 349, 380.
 margaritiferus fistulosus, 382, 383.
 margaritiferus margaritiferus, 382, 383.
 margaritiferus occidentalis, 381, 382, 383.
duboulahi, *Thaumatocoma*, 604.
ducalis, *Ptiloglossa*, 594.
Dufourea, 547, 573, 606.
 minuta, 547.
 (*Trillia*) *muoti*, 606.
 vulgaris, 547.
dunni, *Conophis lineatus*, 395.
duricauda, *Evalljapyx*, 291.
dybowskii, *Halictus*, 521.
Ebodia, 552.
ecaudata, *Chone*, 102, 135 (fig.).
 Jasminiera, 102, 135.
Echthralictus, 547.
Echthromorpha, 288.
 intricatoria, 288.
Echthrus, 279.
eclipta, *Trupanea*, 9.
 Trypanea, 3, 6 (fig.), 8, 9.
Eclipta alba, 9.
ecostata, *Phyllophaga*, 158, 159, 160.
Ecplectica, 547.
 tintinnans, 547.
edensis, *Cordillerion*, 493.
 Procoileus, 518.
Edentata, 498.
edwardii, *Canis*, 475, 480, 499, 500 (fig.).
edwardsii, *Melecta*, 570.
 Melissodes, 551.
 Synhalonia, 551.
Egapistia, 528, 547.
elachistus, *Luperodes*, 59, 69.
Electrapis, 547.
electricus, *Malapterurus*, 327, 331.
 Silurus, 331.
elegans, *Himantodes cenchoa*, 385.
 Imantodes, 386.
 Stenotritus, 601.
elegantula, *Hesperapis*, 557.
Eleotridae, 346, 347.
Eleotris, 347.
 gyrinus, 347.
 kribensis, 347, 348.
 (*Culius*) *pisonis*, 347.
 vittata, 347.
Eleusii, 75, 76, 77, 78, 79.
Eleusis, 79, 88.
 tibialis, 88.
Eligmodontia, 489.
 arizonae, 489, 490.
 morgani, 490.
elongata, *Lumbrinerels*, 102, 118.
 Potamilla, 102, 184.
 Trigona (*Tetragona*), 603.
elongatus, *Potamethus*, 102, 134, 135 (fig.).
emarginata, *Osmla*, 522.
emarginatus, *Phileremus*, 530.

- Empecta*, 157.
Emphor, 547.
Emphoropsis, 547, 572.
 murihirta murina, 572.
enavata, *Melissodes*, 545.
encellae, *Andrena* (*Megandrena*), 568.
Encya, 157.
Encyrtidae, 47 .
Endrosa, 162.
Energoponus, 547, 595.
 strenuus, 547.
engrauloides, *Barilius*, 320.
enlaxus, *Phloeosinus*, 452, 453.
enneagrammus, *Celestus*, 370, 373, 374.
 Siderolamprus, 370.
Enalliniana, 547.
 cuspidata, 547.
Entechnia, 547.
Eopisthyrus, 547.
Eothrincostoma, 548.
Epeicharis, 548, 553.
 mexicanus, 548, 553.
Epeoloides, 548, 607.
 ambiguus, 548.
 coecutiens, 548.
Epeolus, 528, 546, 548, 606.
 concavus, 606.
 (*Dipeolus*) *giannellii*, 546.
 glabratus, 595.
 kirbyanus, 525, 587.
 punctatus, 587.
 viperinus, 533, 582.
Epicharis, 532, 536, 548, 553.
 rustica, 548.
Epicharoides, 548.
 bipunctatus, 548.
Epiclopus gayi, 548.
Epihalicoides, 548.
Epimecoideus, 282.
 apicalis, 282.
Epimelissodes, 548.
Epimethea, 548.
 variegata, 548.
Epimonispractor, 548.
 gratiosus, 548.
Epinomia, 549.
Epiplatys, 337.
 bifasciatus, 335, 337.
 chaperi, 335, 338.
 fasciolatus, 335.
 sexfasciatus, 335, 337.
 spillauchen, 335, 337.
Epiurus, 283.
 albicinctus, 284.
Eptesicus, 497.
Equus, 482, 483, 484, 512.
 caballus, 495, 513.
 laurentius, 512, 513.
 minutus, 494.
 nevadanus, 513.
 occidentalis, 513.
 pacificus, 513.
 phlegon, 494.
 semiplicatus, 512.
 sp. 481, 512.
erasa, *Trypanea*, 5, 6 (fig.), 16.
erberi, *Andreaea*, 534.
erecta, *Lumbriconereis*, 102, 120.
 Lumbrineris, 102, 119 (fig.), 120, 121, 122.
eremicus, *Lepus californicus*, 511.
Eriades, 549, 557.
Eriocroci, 549.
erigeniae, *Andrena*, 594.
Erigeron, 16.
erigeronis, *Nomada*, 534.
Eriocrania semipurpurella, 276.
Eriocranillidae, 276.
Eriops, 549, 582.
ernestini, *Chasolium*, 88.
Eryops, 549.
Erythrina cristagalli, 190.
 sp., 186.
Erythropimpla, 284, 285.
 abbottii, 285.
Erythrosmia, 549.
Espeson, 88.
 (*Parespeson*) *angustissimus*, 88.
 moratus, 88.
Eteone, 113.
 trilineata, 101, 111 (fig.), 113.
etrusca, *Haplidia*, 174.
Euandrena, 549.
Euasps, 546, 549.
 abdominalis, 546.
eucalypti, *Meroglossa*, 572.
Eucara, 549.
Eucera, 519, 549.
 antennata, 566, 603.
 (*Cubitalia*) *breviceps*, 543.
 clavicornis, 572.
 curvicornis, 602.
 longicornis, 549.
Eucervus, 518.
Eucondylops, 549.
 konowi, 549.
Eufriesea, 549, 550.
Eugastra, subg., 161, 162.
eugenia, *Trypanea*, 2, 5, 6 (fig.), 8, 13.
 Urellia, 8.
Eugenia jambolana, 43.
Euglages, 549.
Euglages scripta, 549.
Euglossa, 539, 550, 588.
 cordata, 539, 550.
 dentata, 552.
 piliventris, 554.
 pulchra, 549, 550.
euglossoides, *Melittoma*, 570, 571.
Euharbstia, 550.
 excellens, 550.
Eulaema, 535, 550.
Eulaenia, 549, 550.
Eulalia, 112.
 maculosa, 101, 112.
 sanguinea, 112.
 viridis, 101, 111 (fig.), 112.
Eulamus, 78.
Eulema, 550.
Eulonchopria, 550.
 psaenythioides, 550.
Eumalus, 79, 88.
 strigosus, 88.
Eumegachile, 550.

- Eumida*, 112.
 sanguinea, 101, 105 (fig.), 112.
Eumidia vivida, 101, 112.
Eumorpha, 549, 550.
Eunomia, 546, 550.
 marginipennis, 546, 550.
Eupalacorchiza, 550.
 papuana, 550.
Eupetersia, 533, 551, 571.
 neavel, 551.
 scotti, 576.
Eupholoe, 106.
 acuminata, 101, 106, 109.
 cirrata, 101, 105, 106.
euploeae, *Brachymeria*, 42.
Euprepis microcephalus, 369.
Euprosopis, 551.
Euryapis, 551, 580.
Euryglossa, 551.
 albocuneata, 593.
 cupreochalybea, 551.
 nigra, 551.
 semipurpurea, 551.
Euryglossella, 551.
 minima, 551.
Euryglossidia, 551.
 rectangulata, 551.
Euryglossimorpha, 551.
Euryglossina, 551.
Euryrhopalus, 47, 49.
 schwarzi, 49.
Eurytis, 551.
 funereus, 551.
Eusynhalonia, 551.
Euterpe oleracea, 195.
Euthyglossa, 551.
 fasciata, 551.
Eutricharaea, 551, 583.
Eutropius, 331.
 altipinnis, 331.
 liberiensis, 327, 331.
 mandibularis, 327, 331.
 niloticus, 327.
euxantha, *Prosopis*, 554.
 Spinoliella, 539.
Evalljapyx bruneri, 292.
 crassicauda, 293.
 duricauda, 291.
 manni, 292.
eversa, *Dendrocyna*, 479.
eversmannii, *Citellus*, 506.
Evodia, 540.
Evylaeus, 552.
Exaerete, 533, 538, 552.
 dentata, 533, 538.
excellens, *Eutherbstia*, 550.
excisicollis, *Aneucamptus*, 88.
 Thoracophorus, 88.
exiguus, *Ancaeus*, 90.
 Lispinus, 90.
 Paralispinus, 86, 90.
exil, *Mucidobombus* (*Exilobombus*), 552.
Exilobombus, 552.
Exomalopsis, 548.
Exomalopsis, 552, 581.
 aureopilosa, 552.
 (*Pachycerapis*) *cornigera*, 581.
 fulvipilosa, 552.
Exoneura, 552.
 bicolor, 552.
Exoneura libanensis, 552.
Exoneuridia, 552.
explicandus, *Lispinodes*, 88.
exquisitus, *Neodryocoetes*, 181, 196.
 Neopityophthorus, 181.
Ewing, H. E., and Irving Fox, on new neotropical insects of the apterygotan family Japygidae, 291.
extraordinarius, *Hallictus*, 547.
Eynomioides, 550.
ezonata, *Habrophora*, 556.
Fabaceae, 178.
fabriciana, *Apis*, 577.
 Nomada, 577.
facilis, *Prosopis*, 576.
fairchildi, *Cyaneoderes*, 543.
falcifer, *Sphcodes*, 547.
falcipinnis, *Mugil*, 302.
farceta, *Phyllophaga*, 161.
fasciata, 552.
fasciata, *Euthyglossa*, 551.
fasciatella, *Centris* (*Poecillocentris*), 589.
fasciatus, *Bremus*, 532.
 Hemichromis, 339, 341, 342.
 Nannocharax, 313, 314.
 Pseudepeolus, 593.
fasciolatus, *Epiplytus*, 335.
 Haplochilus, 337.
Fascista, 552.
fatalis, *Sophrobombus*, 600.
favosa, *Apis*, 570.
fawcetti, *Mucuna*, 183.
Felis angustus, 505.
 atrox, 480, 505 (fig.).
 concolor, 485.
 hillanus, 504, 505.
 lacustris, 504 (fig.).
 sp., 480, 485.
 veronis, 505.
femoralis, *Apis* (*Andrena*), 522.
femoralis, *Pseudolispinodes* (*Libriana*), 82, 86, 88, 89.
femoralis, *Trypanea*, 3, 6 (fig.), 10, 17.
 Trypeta 10.
fenestrata, *Apis*, 530, 542.
fenningeri, *Andrena* (*Scrapteropsis*), 599.
fernaldae, *Psithyrus*, 552.
Fernaldaepsithyrus, 552.
ferraripezzi, *Sceloporus ferraripezzi*, 359.
ferrea, *Caesalpinia*, 204.
ferrugineum, *Joppidium*, 281.
ferrugineus, *Opisoxestus*, 280, 281.
Fertonella, 552, 587.
fertoni, *Solenopalpa*, 600.
fervida, *Melolontha*, 162.

- Fervidobombus**, 597.
 rubicundus, 597.
Fervidobomus, 553.
fervidus, *Apis*, 553.
 Bremus, 553.
Ficus ampelas, 43.
Fidelia, 553.
 paradoxa, 553.
fiebrigi, *Protodiscelis*, 592.
fieldi, *Thyce*, 164.
filamentosus, *Chrysichthys*, 328, 332.
Filatima, 272, 273.
 albicostella, 272.
 cushmani, 273.
 roceliella, 271.
filicollis, *Pterobothrium*, 31.
filifer, *Petaloproctus*, 102, 119 (fig.), 131.
filifera, *Lumbriclymene*, 131.
 Maldane, 102, 131.
 Mastigomaldane, 131.
filigera, *Audouinia*, 127.
 Cirriformia, 101, 127.
filigerus, *Lumbricus*, 127.
finbriata, *Ammotrypane*, 101, 128.
finbriatus, *Gerrhonotus*, 364, 368.
Florentinia, 548, 553.
frestonci, *Paramphilius*, 301, 328, 333.
Fishes of Liberia, fresh-water, 301.
†fistulosus, *Drymobius margaritiferus*, 382, 383.
flaccida, *Juniperus*, 455, 472, 473.
flava, *Psammolyce*, 101, 105 (fig.), 108, 109.
flavescens, *Oxaca*, 544, 580.
flavicornis, *Osmia*, 601.
flavida, *Poecilomelitta*, 589.
flavifrons, *Calliopsis*, 553, 583.
 Camptopoeum, 553.
flavilabris, *Nomia*, 588.
flavipes, *Andrena*, 608.
 Megachile, 528.
flavofasciatus, *Haliectus* (*Corynura*), 596.
flavomaculatum, *Lepidophyma flavomaculatum*, 379.
flavomarginatum, *Anthidium*, 560.
flavoniger, *Luperodes*, 59, 64.
flavorufus, *Andrenopsis*, 525.
Flies, American, Notes on two genera of the family Trypetidae, 1.
flomoi, *Barbus*, 301, 317, 323.
florea, *Apis*, 573.
Florida sharks, Some cestodes from, 25.
floridana, *Anthophora*, 547.
 Habropoda, 547.
floridanus, *Boreostracon*, 499.
 Sylvilagus, 481, 511.
Florilegus, 553.
florisomnis, *Apis*, 537, 557.
florissantensis, *Calyptapis*, 533.
foetida, *Pluchea*, 19.
fonscolombi, *Brachymeria*, 43.
 Melissodes, 571.
forbesii, *Cupressus*, 421, 472, 473.
Formica nigra, 563.
Formicapis, 553.
 clypeata, 553.
formosa, *Gerrhonotus*, 365.
formosus, *Cryptus*, 277.
 Sceloporus, 349, 351, 354, 355.
 Sceloporus formosus, 352, 353, 354, 356.
forskali, *Hydrocyon*, 312, 315.
fortis, *Megachile*, 587.
 Pityophthorus, 223.
fossilis, *Neotoma*, 481, 491.
fragilis, *Andrena*, 606.
 Phyllodoce, 102, 111.
Fraternobombus, 553.
fraternus, *Alpigenobombus* (*Fraternobombus*), 553.
 Apathus, 553.
Freda, N. Dak., meteorite: A nickel-rich ataxite, 21.
Fresh-water fishes of Liberia, 301.
freygessneri, *Stelis*, 592.
fricki, *Gigantocamelus*, 497, 513.
Friesea, 553, 583.
 brasiliensis, 553, 583.
 friesei, *Parafidelia*, 583.
 friesei, *Prosopis*, 530, 569.
 Rhopitulus, 597.
Friesemellita, 553.
frigida, *Megachile*, 544.
frisel, *Rhopitulus*, 597.
frontalis, *Phloeosinus*, 402, 421, 472, 473.
 Prosopis, 534.
fructifera, *Teleutemnesta*, 603.
fuchsi, *Panurgomia*, 582.
fuciformis, *Osmia*, 569.
fugitiva, *Sangamona*, 518.
fulgens, *Phloeosinus*, 403, 427, 428, 429, 472, 474.
fulgida, *Chlorosmia*, 538.
 Osmia, 538.
fulva, *Melipona*, 570.
 Xenoglossa, 607.
fulvicollis, *Caupolicana*, 567.
fulvitaris, *Melissodes*, 602.
fulviventris, *Apis*, 537.
 Phileremus, 554, 576.
fulvo-crustatus, *Andrena* (*Campylogaster*), 534.
fulvohirta, *Paracentris*, 582.
fulvopilosa, *Exomalopsis*, 552.
fulvopilosum, *Plesianthidium*, 588.
fulvus, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
fumida, *Thygatina*, 604.
Funebribombus, 553.
funebri, *Alpigenobombus* (*Funebribombus*), 553.
 Andrena, 525.
 Bombus, 553.
funereus, *Eurytis*, 551.
furcicaudata, *Melolontha*, 173.
furcifer, *Capromeryx*, 517.
Furcosmia, 553, 587.

- furnissi*, *Phloeosinus*, 469, 472, 473, 474.
fuscipennis, *Dilobopeltis*, 546.
Protandrenopsis, 591.
- gabonica*, *Koptortosoma*, 561.
gadovii, *Gerrhonotus*, 364, 369.
 Gahan, A. B., on descriptions of five new species of Chalcidoidea, with notes on a few described species (*Hymenoptera*), 41.
gaigeae, *Gaigeia*, 380.
Gaigeia, 374, 379.
dontomasi, 374, 376, 377, 380.
gaigeae, 380.
radula, 376.
sylvatica, 380.
Galeocerdo arcticus, 25, 28.
galliae, *Tilapia*, 344.
galliaeus, *Sparus*, 344.
Gallinula sp., 479.
gambeli, *Peromyscus maniculatus*, 489.
gambiensis, *Barbus*, 322.
Gastrohaliectus, 553.
Gastropsis, 554, 571, 579.
victoriae, 571.
gayatinus, *Haliectus*, 590.
gayi, *Caupolicana*, 534.
Diphaglossa, 546.
Epicopus, 548.
Haliectus (*Corynura*), 540, 567.
 Gazin, C. Lewis, on the late Cenozoic vertebrate faunas from the San Pedro Valley, Ariz., 475.
Gelechia, 269.
Gelechiidae, 267.
gemmistratus, *Himantodes*, 385.
Imantodes, 385, 388, 390, 391.
geniculata, *Arabella*, 125.
Geomys, 487, 507, 508.
minor, 487.
parvidens, 507.
persimilis, 487, 507.
texensis, 487, 508.
Geoperdita, 554.
georgica, *Megachile*, 554, 598.
Osmia, 555.
Gerres melanopterus, 302.
Gerrhonotus, 349, 363.
alfaroi, 364.
antauges, 364, 369.
auritus, 364.
bocourti, 364, 369.
burnettii, 365.
caeruleus, 364, 365, 368.
cedrosensis, 365.
deplii, 364, 367, 368.
digueti, 364.
fimbriatus, 364, 368.
formosa, 365.
gadovii, 364, 369.
gramineus, 364, 368.
grandis, 365.
ignavus, 365.
imbricatus, 364, 367.
imbricatus adpersus, 365, 368.
imbricatus imbricatus, 365, 368.
kingii, 365, 368.
- Gerrhonotus levicollis ciliaris*, 365, 368.
levicollis levicollis, 365, 367, 368.
lichenigerus, 365.
llocephalus, 364, 365, 368, 370.
llocephalus infernalis, 365, 369.
llocephalus lemniscatus, 365.
llocephalus llocephalus, 365, 369.
llocephalus ophiurus, 365, 369.
llocephalus tessellatus, 365.
llocephalus ventralis, 365.
marginata, 365.
microcephalus, 370.
modestus, 364, 369.
monticola, 364.
moreletii, 364.
multicarinata, 365.
multifasciata, 365.
nanus, 365.
nobilis, 365.
oaxaca, 364, 367, 368.
obscurus, 364, 369.
ochoterenal, 364, 368.
olivaceus, 365.
palmeri, 365.
paucicarinatus, 365.
planifrons, 365, 367, 368.
principis, 365.
rhombifer, 365.
rudicollis, 365, 368.
salvadorensis, 364.
scincicauda, 365.
shastensis, 365.
taeniatus, 364, 368.
vasconcelosii, 364.
viridiflavus, 364, 369.
webbii, 365.
wiegmanni, 365.
gerstaeckeri, *Morgania*, 574.
gestroi, *Rhopalophorus*, 88.
glannellii, *Epeolus* (*Diepeolus*), 546.
gibba, *Nomada*, 600.
Sphex, 545, 600.
gidleyi, *Capromeryx*, 481, 482, 517 (fig.).
Dipodomys, 480, 506, 507.
giganteus, *Hylaeus*, 568.
Palaeorhiza, 568.
gigantissima, *Phyllophaga*, 158, 159.
Gigantocamelus fricki, 497, 513.
gigas, *Gymnorhynchus*, 31.
gilberti, *Turnerella*, 607.
 Gilmore, Charles W., on osteology of *Polyglyphanodon*, an Upper Oretaceous lizard from Utah, 229.
glabra, *Cupressus*, 446, 472, 473.
glabratus, *Epeolus*, 595.
 Glassell, Steve A., on a new stomatopod crustacean from the west coast of Mexico, 53.
gleasoni, *Robertsonella*, 597.
globulifera, *Gnathoprosopis* (*Sphaerhy-laeus*), 600.
gloriosa, *Megacillissa*, 592.
Oxaea, 592.
Glossoperdita, 554.
Glossura, 554.
glutinosus, *Heriades*, 592.

- Glycera*, 126.
 lancadivae, 126.
 mexicana, 101, 111 (fig.), 126.
 papillosa, 126.
Glyceridae, 126.
Glyphandrena, 554.
Glyphiterygidae, 275.
Glyptapis, 554.
 mirabilis, 554.
Glyptogastra, 288.
 hawaiiensis, 288.
Glyptoma, 88.
 crassicorne, 88.
Glyptotherium arizonae, 480, 482, 498.
 texanum, 499.
Gnaphthallum obtusifolium, 15.
Gnathias, 554.
Gnathocera, 535, 554, 598.
 cephalica, 554.
Gnathodon, 554, 598.
Gnathonemus mento, 308, 310.
 ussleri, 308, 310.
Gnathopasites, 554, 576.
Gnathoprosopis, 554, 600.
 (*Sphaerhylaues*) *globulifera*, 600.
Gnathosmia, 555.
Gnathotrichus, 177, 178, 227.
 deleoni, 227.
Gnathylaues, 555.
 williamsi, 555.
Gnormioschema, 268, 269.
 • *arnicella*, 268.
 princeps, 268.
Gobiidae, 346.
Gobioidae, 346.
Gobius aeneofuscus guineensis, 347.
 guineensis, 346, 347.
 koelreuteri, 346.
 niger, 347.
 petrophilus, 347.
 psonis, 347.
 soporator, 347.
 (*Chonophorus*) *tajasica*, 347.
goeldiana, *Tetrapedia*, 562, 598.
goheeni, *Mormyrus*, 307, 308.
Gonandrena, 555, 606.
Goniocolletes, 555.
 morsus, 555.
goryi, *Acanthopus*, 541, 571.
 Ctenioschelus, 571.
gracilis, *Polyphylla*, 164.
 Spilogale, 502.
gracillima, *Dipsas*, 387.
gracillimus, *Himantodes*, 387.
 Imantodes, 387, 391.
graeffei, *Colletes*, 544.
graga, *Macrocera*, 603.
 Tetraloniella, 603.
grala, *Macrocera*, 603.
 Tetraloniella, 603.
gramineus, *Gerrhonotus*, 364, 368.
granadensis, *Lispinus* (*Lispinus*), 90.
grandidieri, *Thrausmus*, 604.
grandis, *Cirratus*, 101, 126.
 Gerrhonotus, 365.
 Lumbriconeris, 102, 114.
 grandis, *Lumbrineris*, 102, 114, 115 (fig.).
 Osmia, 568.
Granida albosparsa, 172, 175.
graniger, *Dendroctonus*, 452.
 Phloeosinus, 452, 453.
granulatus, *Phloeosinus*, 399, 402, 419, 472, 473.
Graphiocrinus, 151.
gratiosa, *Augochlora*, 520.
gratiosus, *Epimonispractor*, 548.
Great Plains, scored bone artifacts, 91.
greavesi, *Meltribus*, 571.
Greeleyella, 555.
 beardsleyi, 555.
gribodol, *Trigona*, 560.
grindeliae, *Nomada*, 569.
grisea, *Monia*, 574.
griseocollis, *Apis*, 599.
Gronoceras, 555.
 bombiformis, 555.
 combusta, 546.
 wellmanni, 555.
grubel, *Leanira*, 102, 106.
grubel, *Sthenelais*, 102, 106.
guatemalensis, *Akleistops*, 380.
gutanae, *Neodryocoetes*, 181, 186.
guineensis, *Gobius*, 346, 347.
 Gobius aeneofuscus, 347.
Gundlachia, 555, 558.
Gymnandrena, 555.
Gymnorhynchus gigas, 31.
 malleus, 31.
Gymnotus kapirat, 306.
Gymnus, 535, 555, 601, 605.
Gynnis, 162.
 debilis, 162.
gyrinus, *Eleotris*, 347.
Gyrodroma, 535, 555, 556, 601, 605.
 nigricornis, 556.
haagii, *Dendroctonus*, 452.
 Phloeosinus, 452, 453.
Habrophora, 556.
 ezonata, 556.
Habropoda floridana, 547.
Hackeriapis, 556.
Hadrodactylus longicornis, 289.
haemorrhoidalis, *Andrena*, 538.
 Apis, 557.
 Centris, 557.
Halictanthrena, 556.
 malpighiacearum, 556.
halictoides, *Andrena*, 576.
 Halictus, 576.
 Leptergatis, 563.
 Perdita, 586.
Halictoides, 524, 535, 548, 583.
 campanulae, 583.
 dentiventris, 556.
 ilicifoliae, 524.
 marginatus, 548.
 maurus, 575.
 paradoxus, 535.
 ruficaudus, 573.

- Haliotomorpha**, 556.
 phaedra, 556.
Haliotus, 540, 542, 553, 556, 559, 560, 566,
 574, 576, 580, 581, 586, 597.
 (*Oxyhaliotus*) *acuiferus*, 580.
 anomalus, 545.
 arcuatus, 552.
 buccinus, 560.
 cephalicus, 583.
 cephalotes, 583.
 chlerogas, 538.
 (*Lucasius*) *clavipes*, 565, 566.
 (*Conanthaliotus*) *conanthi*, 540.
 coriaceus, 543.
 cressoni, 538.
 dybowskii, 521.
 extraordinarius, 547.
 (*Corynura*) *flavofasciatus*, 596.
 gayatinus, 590.
 (*Corynura*) *gayi*, 540, 567.
 haliotoides, 576.
 horni, 536.
 inflaticeps, 596.
 lasureus, 533.
 ligatus, 579.
 (*Rostratiliapis*) *macrognathus*, 597.
 merescens, 581.
 multiplex, 603.
 nigromarginatus, 593.
 ochrias, 568.
 (*Gastrohaliotus*) *osmioides*, 553.
 (*Paragapostemon*) *podager*, 583.
 purus, 529.
 (*Nesohaliotus*) *robbii*, 576.
 (*Patellapis*) *schultzei*, 586.
 seladonius, 599.
 taclobanensis, 559.
 tomentosus, 574.
 torridum, 548.
hancocki, *Sthenelais*, 107, 108.
Haplidia, 157, 163.
 etrusca, 174.
 transversa, 163.
Haplochilus *chaperi*, 338.
 fasciolatus, 337.
 intrafasciatus, 337.
 liberlensis, 335.
 spllauchen, 337.
Haplomelitta, 556.
Harmopsides, 103.
 natans, 101, 102.
Hartman, Olga, on the identity of some
 marine annelid worms in the United
 States National Museum, 101.
hatterifiana, *Andrena*, 537.
 Nomada, 537.
hawaiiensis, *Glyptogastra*, 288.
 Pleuroneurophion, 288.
hebes, *Trypanea*, 11.
Helicospira, 556.
Heliothila, 556, 598.
Heliothilus, 598.
helvola, *Apis*, 525.
Hemerophila, 275.
Hemichromis, 341, 342.
 bimaculatus, 338, 341, 342.
 fasciatus, 339, 341, 342.
Hemihaliotus, 557.
Heminomada, 557, 607.
Hempimpra, 284.
Hemipodus *mexicanus*, 101, 126.
Hemirhamphus *schlegelii*, 302.
Hemisla, 535, 557.
Henderson, E. F., on the *Sardis* (Geor-
 gia) meteorite, 141.
Henderson, E. P., and Perry, Stuart H.,
 on the Freda, N. Dak., meteorite: A
 nickel-rich ataxite, 21.
henryi, *Isichthys*, 307, 309.
henshawii, *Apis* (*Synapis*), 602.
Hepsetus, 315.
 odoë, 312, 315.
Heptaphylla, 157.
heraldica, *Prosopis*, 578.
herbsti, *Colletes* (*Pollana*), 589.
 Lonchopria, 565.
Herbstiella, 557, 561.
 chilensis, 557, 561.
Heriades, 549, 556, 557, 578, 583, 607.
 carinata, 588.
 glutinosus, 592.
 nigricornis, 556.
 opuntiae, 528.
 philadelphii, 590.
 rapunculi, 557.
 semirubra, 591.
 simplex, 597.
 tricarlinatus, 578.
 truncorum, 607.
 (*Neotrypates*) *variolosa*, 576.
Heriadopsis, 557.
 striatulus, 557.
Herpetodryas *margaritifera*, 383.
Hesperapis, 534, 557, 608.
 elegantula, 557.
Hesperonomada, 557.
 melanantha, 557.
hesternus, *Camelops*, 496.
 Micropalama, 480.
Heteranthidium, 557.
Heterapis, 557.
Heterapis *delicata*, 557.
Heterapoides, 557.
Heterobranchus, 332.
 bidorsalis, 332.
 isopteris, 328, 332.
Heterocentris, 555, 558, 596.
Heterocolletes, 558.
heterodoxa, *Andrena* (*Ancylandrena*),
 525.
 Polyglossa, 584.
heterodoxus, *Notocolletes*, 578.
Heterogeomys, 508.
heteropoda, *Lumbriconereis*, 102, 121.
 Lumbrineris, 102, 115 (fig.), 121,
 123.
Heterorhiza, 558.
Heterosarus, 558.
Heterotheca *subaxillaris*, 20.
Heterotrigona, 558.
Hexepeolus, 558.
Hexepeolus *mojavensis*, 558.
Hidalgoensis, *Pityophthorus*, 215.
Hieracium, 16.

- hieroglyphica, Ceratina, 536.
 hilactus, Parasphecodes, 535.
 Hill, A. T. (See Wedel and Hill.)
 hillanus, Felis, 504, 505.
 Himantodes cenchoa elegans, 385.
 gemmistratus, 385.
 gracillimus, 387.
 leucomelas, 384.
 tenuissimus, 390.
 Hipparion, 494, 495.
 phlegon, 494.
 hirsutulum, Camptopoeum, 564.
 hirticula Melolontha, 161.
 hirtipes, Andrena, 544, 589.
 Apis, 535, 543.
 Centris, 548.
 Tarsalia, 603.
 hispidus, Sigmodon, 491, 509.
 histricus, Leanira, 101, 105.
 histrio, Nomada, 570.
 histronica, Melecta, 541.
hoferi, Phloeosinus, 401, 412, 472, 474.
 Holandrena, 553.
 Holcopasites, 553.
 Holmbergia, 553.
 cristariae, 553.
 Holmbergiapis, 523, 553.
 Holochilus, 491.
 Holonomada, 553.
 holosericea, Odyneropsis, 579.
 Holosus, 77, 83, 84, 88, 90.
 bistriatus, 81.
 (*Neolosus*) insularis, 85, 90.
 longipennis, 90.
 madurensis, 80, 81, 88.
 mycetoporiformis, 84, 88.
 (*Relinda*) mycetoporiformis, 84, 85, 88, 90.
 (*Holosus*) navicularis, 85, 90.
 olisthaeriformis, 84.
 (*Relinda*) olisthaeriformis, 84, 85, 90.
 sinuatus, 80, 90.
 tachiniformis, 84, 88.
 (*Holosus*) tachiniformis, 85, 90.
 tachyporiformis, 88.
 (*Neolosus*) tachyporiformis, 84, 85, 88, 90.
 Holosus, subg., 73, 84, 90.
 Holotrichia, 157, 164, 165.
 pubera, 165.
 Holotrochus, 84.
 holzneri, Sylviagrus floridanus, 492.
 Homachthes, 553, 580.
 Homallctus, 559.
hoodi, Neodryocoetes, 181, 187.
 Hoplandrena, 559.
 Hoplasoma, 62.
 Hoplyphora, 543, 551, 559, 580.
 velutina, 580.
 Hoplitella, 559.
 pentamera, 559.
 Hoplitina, 559.
 Hoplitis, 542, 559.
 Hoplochelus, 157.
 Hoplonomia, 559.
 quadrifasciata, 559.
 Hoplopasites, 559.
 Hoploprosopis, 559.
 Hoplosmia, 559.
 hoppingi, Phloeosinus, 401, 411, 412, 413, 415, 419, 472, 473, 474.
 horni, Halictus, 536.
 horridus, Sceloporus horridus, 361.
 Hortobombus, 559.
 hortorum, Apis, 559.
 Bombus, 559.
hostilis, Neodryocoetes, 181, 189.
hubbardi, Neodryocoetes, 181, 182.
hubbardi, Pityophthorus, 215, 216.
humilis, Andrena, 538.
 Chalcobombus, 536.
 Isomalus, 88.
humilis, Neodryocoetes, 181, 188.
humilis, Palmatochromis, 339, 342, 343.
husela, Prosopis, 551.
hyalina, Perdita, 539.
hyalinata, Hylaeus, 600.
 Prosopis, 600.
 Hydrocyon, 315.
 forskali, 312, 315.
 Hydrosaurus pustulosus, 235.
 Hylaeosoma, 559.
 longiceps, 559.
 Hylaeus, 519, 560, 576, 579, 586, 590, 591, 606.
 albilabris, 536, 539.
 (Koptogaster) bifasciatus, 561.
 brevicornis, 544.
 cornuta, 521.
 giganteus, 568.
 hyalinata, 600.
 (*Nesylaeus*) nesoprosopoides, 576.
 pictipes, 584.
 sexcinctus, 556.
 signatus, 560.
 tomentosus, 574.
 Hyleoides, 560.
 Hylesinus cristatus, 443.
 dentatus, 452.
 serratus, 456.
 thujae, 400.
 Hylodecrinus, 151.
 Hylurgus dentatus, 452.
 Hymenaea courbaril, 187.
 sp., 186.
 hymenaeae, Neodryocoetes, 179, 181.
 Hymenoptera, descriptions of five new species of Chalcidoidea, with notes on a few described species, 41.
 Hypanthidium, 560.
 hypnorum, Apis, 595.
 Bombus, 595.
 Hypochrotaenia, 560, 577.
 parvula, 560.
 Hypolagus, 492, 514.
 browni, 492.
 sp., 481, 492.
 Hypomacrotera, 560.
 callops, 560.
 Hyponomeutidae, 275.
 Hypophthalmus niloticus, 331.
 Hypotrigona, 560.

- Hypsicamara*, 46.
lachni, 46.
ratzeburgi, 46.
Hypsicomus, 133.
circumspiciens, 102, 133.
purpureus, 102, 133.
sp., 102, 133.
Ichneumon-flies, genotypes of some of Ashmead's genera, 277.
Ictidomys, subg., 506.
idahoensis, *Ondatra*, 511.
Plesippus, 484.
Idioprosopis, 560.
chalcidiformis, 560.
ignavus, *Gerrhonotus*, 365.
ignita, *Angochlora*, 529.
Iguana, 230, 239, 240, 242, 244, 245, 249, 250, 254, 255, 256, 257, 258, 263.
ilicifoliae, *Haliotoides*, 524.
illinoisensis, *Phileremus*, 558.
illustre, *Anthidium*, 533.
Imantodes, 349, 384.
cenchoa, 386.
cenchoa leucomelas, 384, 391.
cenchoa semifasciatus, 385.
elegans, 386.
gemmistratus, 385, 388, 390, 391.
gracillimus, 387, 391.
latistratus, 387, 390, 391.
splendidus, 380, 387, 388.
splendidus lucidorsus, 388, 389, 391.
splendidus oliveri, 388, 391.
splendidus splendidus, 388, 389, 391.
tenuissimus, 390, 391.
imbricatus, *Gerrhonotus*, 364, 367.
Gerrhonotus imbricatus, 365, 368.
imitatus, *Leoproctus*, 563.
immaculata, *Clelia clelia*, 394.
immucronatus, *Sceloporus jarrovi*, 359, 360.
impar, *Lispinus*, 89.
Pseudolispinodes (*Pseudolispinodes*), 89.
Imperfecta, 544.
Imperfecta, *Trypanea*, 3, 5, 6 (fig.), 10.
Urellia, 10.
impressicollis, *Lispinus*, 80, 89.
Pseudolispinodes (*Pseudolispinodes*), 89.
incana, *Melolontha*, 173.
incerta, *Squilla*, 56.
incertus, *Chalepogenus*, 537.
indecisus, *Protobombus*, 592.
indica, *Sabella*, 132.
Sabellastarte, 102, 132.
indicus, *Tetrapleurus*, 88.
Indohalictus, 560.
infernalis, *Gerrhonotus liocephalus*, 365, 369.
infaticeps, *Corynura*, 596.
Corynuropsis, 596.
Halictus, 596.
infrafasciatus, *Haplochilus*, 387.
infundibuliformis, *Chone*, 102, 136.
inquirenda, *Orphana*, 563, 580, 595.
Insects, neotropical, of the apterygotan family Japygidae, 291.
insigne, *Dasyrhynchus*, 25, 29 (fig.), 30.
insolitus, *Tripeolus* (*Synepeolus*), 602.
instabilis, *Polistes*, 44.
insularis, *Blepyrus*, 47.
Holusus (*Neolusus*), 85, 90.
Lispinus (*Lispinus*), 90.
Neodryocoetes, 181, 194, 199.
integerrima, *Nomada*, 587.
integra, *Megachile*, 607.
Nomada, 587.
intermedia, *Pseudopotamilla*, 133.
intermedius, *Nannocharax*, 313, 314.
interrupta, *Apis*, 582.
intricatoria, *Echthromorpha*, 288.
inversa, *Phyllophaga*, 160.
involuta, *Callirrhoe*, 69.
inyoensis, *Ashmeadiella* (*Corythochila*), 541.
Iomelissa, 561.
ipomoeae, *Meliphila*, 570.
Xenoglossa, 534.
Ireos, *Apis*, 584.
Podalirius (*Paramegilla*), 584.
iricolor, *Arabella*, 102, 124.
Nereis, 124.
iridescent, *Arabella*, 101, 123, 124.
Protomelissa, 592.
Ischiopsaurus, 77, 78.
boettcheri, 88.
Ischnocera, 561.
Isepeolus, 561.
albopictus, 561.
Isichthys henryi, 307, 309.
Isomalus, 88.
humilis, 88.
Isophrictis, 271.
isopterus, *Heterobranchus*, 328, 332.
itama, *Trigona*, 558.
jacintanum, *Chelostoma* (*Cephalapis*), 535.
jambolana, *Brachymeria*, 41.
jambolana, *Eugenia*, 43.
Tumidicoxoides, 41.
japonica, *Lumbrineris*, 115, 116.
Japyx, 295, 299.
jarrovi, *Sceloporus*, 350, 359.
Sceloporus jarrovi, 360.
Jasminera, 136.
ecaudata, 102, 135.
javanus, *Steganomus*, 601.
jentinkii, *Paratlapia* (*Pelmatochromis*), 343.
Pelmatochromis, 339, 342, 343.
johnsoni, *Arhysosage*, 528.
Opheltoideus, 289.
jonesi, *Trypanea*, 6 (fig.), 15, 17.
Joppidium, 280, 281.
ferrugineum, 281.
jorgenseni, *Nomia*, 578.
jubelini, *Pristipoma*, 303.
jucundo, *Oxyctonia*, 175.

- Junco** sp., 480.
juniperi, *Phloeosinus*, 405, 406, 455, 458, 460, 461, 472, 473.
Juniperus, 397, 401, 406, 462, 470.
 flaccida, 455, 472, 473.
 mexicana, 406, 460, 463, 472, 473.
 monosperma, 407, 462, 470, 472, 473.
 occidentalis, 407, 412, 431, 456, 468, 471, 472, 473.
 pachyphloea, 406, 407, 413, 414, 446, 459, 460, 462, 470, 472, 474.
 scopulorum, 407, 413, 462, 466, 472, 473, 474.
 serratus, 459.
 sp., 456.
 utahensis, 407, 413, 462, 470, 472, 474.
 virginiana, 453, 465, 472, 474.
Jyeri, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
Kallobombus, 583, 561, 600.
kaniksu, *Phloeosinus*, 404, 434, 472, 474.
kansanus, *Camelops*, 496.
kansensis, *Prodiplomys*, 486.
kapirat, *Gymnotus*, 306.
keeni, *Phloeosinus*, 400, 401, 414, 472, 473.
Kelita, 557, 561.
kerquelenensis, *Lumbrineris*, 117.
kingii, *Gerrhonotus*, 365, 368.
kingsleyae, *Anabas*, 345.
 Ctenopora, 345.
Kinosternon arizonense, 477, 479.
Kirbya, 561, 571.
kirbyanus, *Epeolus*, 525, 587.
 Phileremus, 525.
Kirk, Edwin, on *Rhopocrinus*, a new fossil inadunate crinoid genus, 151.
koelreuteri, *Gobius*, 346.
 Periophthalmus, 346.
konowi, *Eucondylops*, 549.
Koptobaster, 561.
Koptogaster, 561, 593.
Koptortosoma, 540, 561.
 gabonica, 561.
kozlovi, *Bombus*, 561.
 Kozlovibombus, 561.
Kozlovibombus, 561.
 kozlovi, 561.
kribensis, *Eleotris*, 347, 348.
Labeo, 318.
 curriel, 317, 318.
labialis, *Andrena*, 558.
labialis, *Melitta*, 558.
labiata, *Andrena*, 589.
 Chelynia, 537.
 Macropis, 566.
 Megilla, 566, 568.
Laboropsithyrus, 561.
laboriosus, *Bombus*, 561.
lacertinus, *Leopodus*, 570.
lachni, *Hypsicamara*, 46.
 Pachycrepis, 46.
Lachnosterna, 159, 162, 165.
 vandinei, 159.
Lachnus australis, 46.
lacustris, *Felis*, 504 (fig.).
Laemactus, 253.
Laesobombus, 561.
laesus, *Agrobombus* (*Laesobombus*), 561.
 Bombus, 561.
laevigatum, *Stilpnosoma*, 601.
Lagobata, 562.
 diligens, 562.
Lagomorpha, 492, 511.
lagopus, *Andrena*, 599.
 Scapter, 599.
Lagripoda, 562.
Lagripode, 562.
lalanza, *Phyllophaga*, 158, 159.
Lambdopsis, 562.
Lambroapis, 562.
 maculipennis, 562.
Lamprocolletes, 562.
 cladocerus, 539.
 venustus, 605.
Lampronia semipurpurella, 276.
lancadivae, *Glycera*, 126.
lanceolata, *Melolontha*, 162.
laneae, *Perdita*, 587.
Lanthanomelissa, 562, 598.
 discrepans, 562.
Laonome punctata, 102, 132.
Lapidariobombus, 561, 562, 569.
lapidarius, *Apis*, 569.
 Bombus, 562, 569.
laportel, *Listrochelus*, 162.
Laranda robusta, 102, 125.
larreae, *Bombomelecta*, 608.
 Perdita, 587.
Larvae of some West Indies melolonthine beetles and a key to the known larvae of the tribe, 167.
Lasioglossum, 562.
 tricingulum, 562.
Lasius, 562, 563, 589.
 salviae, 563.
lasureus, *Halictus*, 533.
lata, *Croceia*?, 549.
lateralis, *Stelis*, 574.
laticeps, *Anthidium*, 528.
 Anthophora (*Eucara*), 549.
laticollis, *Lispinus* (*Lispinus*), 90.
latinmanus, *Megachile*, 607.
laticor, *Perdita*, 567.
latipes, *Apis*, 529, 588.
 Xylocopa, 529, 588.
latistrata, *Dipsas gemmistrata*, 387.
latistratus, *Imantodes*, 387, 390, 391.
latitarsis, *Trigona*, 598.
laticusculus, *Pseudolispinodes*, 79.
latreillei, *Melissoda*, 571.
Lauraceae, 178.
laurentius, *Equus*, 512, 513.
lawsoni, *Pinus*, 216, 218.
Leannira, 104, 106, 107.
 grubel, 102, 106.
 hystrix, 101, 105.
 robusta, 102, 104, 105 (fig.).
lecontei, *Lelopodus*, 585.

- lefebvrei*, *Bombus*, 524.
Leguminosae, 178.
lelophylla, *Pinus*, 203, 205, 206, 211, 220, 227.
lelophyllae, *Pityophthorus*, 205.
Lelopodus, 563, 564, 570.
 lacinatus, 570.
 lecontei, 585.
Leioproctus, 563, 564.
 imitatus, 563.
Leipophorus, 88.
lemniscatus, *Gerrhonotus liocephalus*, 365.
lenis, *Neodryocoetes*, 181, 198.
lepida, *Tentacularia*, 31.
Lepidandrena, 563.
Lepidasthenia, 102, 103.
 alba, 102, 103.
 longicirrata, 104.
 maculata, 103.
 natans, 101, 102.
Lepidiotia, 157.
Lepidophyma, 374, 379.
 flavomaculatum flavomaculatum, 379.
 flavomaculatum obscurum, 379.
 smithii occulor, 378, 379, 380.
 smithii smithii, 378, 379, 380.
 smithii tehuanae, 377, 379, 380.
Lepidotrigona, 563.
lepidus, *Callotetrarhynchus*, 31.
Leporid sp., 493.
lepriouri, *Aplis* (*Melissodes*), 571.
Leptergatis, 546, 563.
 halictoides, 563.
Leptochirini, 75, 76.
Leptochirus, 79.
Leptoglossa, 563, 580, 595.
 paradoxa, 563, 595.
Leptognathus stratissima, 385.
Leptometria, 563.
 pereyrae, 563.
Leptorachis, 563.
Lepus, 483, 492.
 californicus, 481, 511.
 californicus eremicus, 511.
 sp., 481.
Lestis, 563.
Lestrimelitta, 564.
Leucandrena, 564.
Leucobombus, 531, 532, 564, 603.
leucogaster, *Onychomys*, 490.
leucomelas, *Himantodes*, 384.
 Imantodes cenchoa, 384, 391.
leucophthalma, *Melolontha*, 165.
Leucosmia, 564.
levicollis, *Gerrhonotus levicollis*, 365, 367, 368.
libanensis, *Exoneura*, 552.
Libellulapis, 564.
 antiquorum, 564.
Liberia, fresh-water fishes, 301.
Liberania, subg., 78, 82, 88, 89.
Liberiella, subg., 78, 81, 88, 89.
liberiensis, *Aphyosemion*, 334, 335.
 Barbus camptacanthus, 324.
 Clarias, 327, 329, 330.
 Eutropius, 327, 331.
 Haplochilus, 335.
 Mastacembelus, 310.
Libocedrus, 397, 401.
 decurrens, 401, 402, 405, 412, 416, 424, 426, 428, 429, 431, 432, 433, 450, 472, 473, 474.
lichenigerus, *Gerrhonotus*, 365.
ligatus, *Halictus*, 579.
ligusticus, *Bombus*, 567.
limacina, *Ammotrypane*, 130.
 Ophelia, 102, 130.
Hmao, *Trigona*, 564.
linearis, *Lispinus* (*Lispinus*), 90.
 Thamnophthorus, 178.
lineatopunctatus, *Lispinus* (*Lispinus*), 90.
lineatus, *Conophis lineatus*, 395.
liocephalus, *Gerrhonotus*, 364, 365, 368, 370.
 Gerrhonotus liocephalus, 365, 369.
Liogastra, 564, 595.
 bicolor, 564.
Liopodus, 563, 564.
Liopoeum, 564.
Lioproctus, 564.
Liosmia, 564.
Liothyrapis, 564, 583.
Lipanthus sabulosus, 565.
Lipotriches, 565.
 abdominalis, 565.
Lispini, 76, 77, 78, 83, 84, 85.
Lispini and *Osorini*, notes on the classification of the groups, 75.
Lispinini, 75, 76, 77, 78, 83, 84, 85, 88.
Lispinodes, 77, 83, 88.
 bistriatus, 80, 88, 90.
 explicandus, 88.
Lispinoides, *Pseudolispinodes* (*Rumeba*), 82, 87, 88, 90.
Lispinus, 77, 81, 83, 84, 85, 88, 90.
 (*Lispinus*) *aequipunctatus*, 90.
 aethiops, 89.
 attenuatus, 88.
 (*Lispinus*) *attenuatus*, 90.
 (*Lispinus*) *bakeri*, 90.
 beesoni, 89.
 birmanus, 89.
 bistriatus, 81, 83.
 (*Spinilus*) *bistriatus*, 83, 84, 88, 90.
 californicus, 90.
 castaneus, 89.
 (*Lispinus*) *catena*, 90.
 coarcticollis, 89.
 curtipennis, 89.
 exiguus, 90.
 fulvus, 89.
 (*Lispinus*) *granadensis*, 90.
 impar, 89.
 impressicollis, 80, 89.
 (*Lispinus*) *insularis*, 90.

- Lispinus jyeri*, 89.
 (*Lispinus*) *laticollis*, 90.
 (*Lispinus*) *linearis*, 90.
 (*Lispinus*) *lineatopunctatus*, 90.
 longipennis, 83.
 (*Lispinus*) *longipennis*, 90.
 luzonicus, 89.
 madurensis, 81.
 megacephalus, 90.
 (*Lispinus*) *nitidipennis*, 90.
 (*Lispinus*) *parallelus*, 90.
 planellus, 88, 90.
 prolixus, 90.
 (*Lispinus*) *quadracollis*, 90.
 (*Lispinus*) *quadrinotatus*, 90.
 selangorensis, 89.
 sericeiventris, 89.
 sinuatus, 83.
 (*Spinilus*) *sinuatus*, 84, 90.
 specularis, 89.
 (*Lispinus*) *striola*, 90.
 subopacus, 89.
 (*Lispinus*) *tardus*, 90.
 tenellus, 89.
Lispinus, subg., 78, 83, 90.
Listrochelus, subg., 157, 161, 162, 163.
Listrochelus laportei, 162.
Lita, 268, 269.
 princeps, 268.
Lithandrena, 565.
 saxorum, 565.
Lithographis, 564.
Lithosmia, 528, 565.
Lithurge, 565.
Lithurgopsis, 565.
Lithurgus, 565.
 apicalis, 565.
Litomegachile, 565.
littorale, *Ageratum*, 8.
Lizard, an Upper Cretaceous from Utah,
 osteology of *Polyglyphanodon*, 229.
lobata, *Andrena*, 549, 582.
 Dasyopoda, 549, 582.
loetae, *Chlonodes*, 270.
Lonchopria, 556, 565, 578.
 herbsti, 565.
longiceps, *Hylaeosoma*, 559.
longicirrata, *Lepidasthenia*, 104.
longicornis, *Apis*, 549.
 Eucera, 549.
 Hadrodictylus, 289.
longimana, *Centris*, 606.
longipennis, *Holosus*, 90.
 Lispinus, 83.
 Lispinus (*Lispinus*), 90.
 Longispinus, 80.
 Pseudospinodes, 79, 90.
longipinnis, *Alestes*, 312, 315.
 Alestes (*Brachyalestes*), 315.
 Brachyalestes, 315.
Longispinus bistriatus, 80.
 longipennis, 80.
 sinuatus, 80.
longula, *Strandella*, 602.
longurio, *Tanupolama*, 475, 481, 514,
 515, 516 (fig.).
lovelli, *Conohalictoides*, 540.
lowei, *Polypterus*, 303, 304.
Lucasellus, 565.
Lucasiellus, 565, 566.
Lucasius, 565, 566.
lucida, *Polynoë*, 102, 103.
lucileaea, *Mannichthys*, 301, 317, 321.
luciodorsus, *Imantodes splendidus*, 388,
 389, 391.
luggeri, *Polysphinctomorpha*, 288.
Lumbriclymene, 131.
 filifera, 131.
Lumbriconereis acuta, 102, 114.
 bilabiata, 102, 120.
 erecta, 102, 120.
 grandis, 102, 114.
 heteropoda, 102, 121.
 maculata, 102, 119.
 minuscule, 102, 116.
 minuta, 102, 116, 117.
 parva-pedata, 102, 118.
 tenuis, 102, 124.
 zonata, 102, 123.
Lumbricus filigerus, 127.
Lumbrineris elongata, 102, 118.
Lumbrineridae, 114.
Lumbrineris, 114.
 abyssorum, 117.
 acuta, 102, 114, 115 (fig.).
 bilabiata, 102, 120.
 chiersi tenuisetis, 117.
 erecta, 102, 119 (fig.), 120, 121,
 122.
 grandis, 102, 114, 115 (fig.).
 heteropoda, 102, 115 (fig.), 121, 123.
 japonica, 115, 116.
 kerguelensis, 117.
 maculata, 102, 119 (fig.), 130 (fig.).
 minuscule, 102, 116, 121 (fig.).
 moorei, 102, 116, 121 (fig.).
 mucronata, 114.
 neo-zealandiae, 117.
 parva-pedata, 102, 115 (fig.), 118.
 punctata, 117.
 robusta, 119.
 sarsi, 123.
 zonata, 102, 123 (fig.).
lunaei, *Sceloporus*, 355, 356.
lunaris, *Batia*, 274.
 Recurvaria, 274.
Luperodes, 57.
 alboplagiatus, 58.
 bivittatus, 57, 58, 59, 61, 63.
 brunneus, 57, 58, 59, 67, 73.
 californicus, 58, 63, 64, 65.
 chirocahuensis, 59, 71.
 convexus, 59, 71.
 crassicornis, 59, 74.
 curvatus, 59, 74.
 davisi, 67.
 diegenisi, 58, 60.
 elachistus, 59, 69.

- Luperodes flavoniger*, 59, 64.
marginalis, 65, 66, 69.
melanolomatus, 58, 63.
monorhaddus, 58, 61.
nebrodes, 58, 64.
ocularis, 59, 71, 72.
pallidulus, 59, 68.
popenoei, 59, 70.
punctatissimus, 59, 73.
rugipennis, 59, 68.
semiflavus, 65.
tuberculatus, 58, 62.
vandykei, 59, 73.
varicornis, 57, 59, 65, 67, 69, 70, 71, 74.
Luperus bivittatus, 59.
brunneus, 67.
sp., 70.
varicornis, 65.
lupus, Canis, 501.
lustrans, Panurgus, 557.
lutea, Ctenoapis, 542.
luteicornis, Melissodes, 567.
luteola, Nomada, 607.
lutrea, Nephthys, 113.
Lutziella, 539, 566.
luzonicus, Lispinus, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
lycorias *Augochloropsis* (*Paraugochloropsis*), 585.
Lysicollates, 566.
Machaeris, 566.
 Mackin, J. G., on a new species of phyllopod crustacean from the South-western shortgrass prairies, 33.
macrocarpa, Cupressus, 444, 472, 473.
Macrocera, 566, 603.
 analis, 566.
 graga, 603.
 grala, 603.
 pruinosa, 586.
 ruficollis, 566.
Macrogaelea, 566.
Macrogeomys, 509.
MacroGLOSSA, 566.
 oribazi, 566.
MacroGLOSSAPIS, 566.
macrognathus, *Halictus* (*Rostratilis*), 597.
macrolepidotus, Alestes, 316.
 Alestes (*Brycinus*), 316.
Macronomia, 566.
Macropsis, 56, 567, 568, 583, 590.
 labiata, 566.
Macrotera, 567.
 bicolor, 567.
Macroteropsis, 567.
macroura, Nephthys, 113.
 Nephthys, 102, 111 (fig.), 118.
maculata, Armandia, 102, 129, 130 (fig.).
 Lepidasthenia, 103.
 Lumbriconereis, 102, 119.
 Lumbrineris, 102, 119 (fig.), 130 (fig.).
maculata, Melecta, 573, 608.
 Ophellina, 102, 129.
 Psites, 585.
maculipennis, Colletes (*Ptilopoda*), 594.
 Lambroapis, 562.
maculosa, Eulalia, 101, 112.
madurensis, Holosus, 80, 81, 88.
 Lispinus, 81.
 Pseudolispinodes, 80, 81, 88.
magister, Neotoma, 491.
magnaoculata, Phyllodoce, 102, 110, 111 (fig.).
magnus, Cupidinimus, 487.
majalis, Rhizotrogus, 175.
malachiticus, *Sceloporus malachiticus*, 356.
Malapterurus, 331.
 electricus, 327, 331.
Maldane filifera, 102, 131.
Maldanidae, 131.
malleum, Pterobothrium, 81.
malleus, Gymnorhynchus, 31.
 Malloch, John R., on two genera of American flies of the family Trypetidae, 1.
malmgreni, Potamilla, 134.
malpighiacearum, *Halictanthrena*, 556.
malvae, Apis, 566, 603.
mandibularis, Eutropius, 327, 331.
manifestus, Panurgus, 533.
manni, Ewalljapyx, 292.
manni, *Micropanchax macrurus*, 301, 334, 336.
Mannichthys, 301, 320.
 luciteae, 301, 317, 321.
Manuelia, 567.
Mapo soporator, 347.
marchei, *Mastacembelus*, 310.
Marcusenius brachyistius, 307, 310.
margaritiferus, *Drymobius*, 349, 380.
 Drymobius margaritiferus, 382, 383.
 Herpetodryas, 383.
marginalis, *Luperodes*, 65, 66, 69.
marginata, *Gerrhonotus*, 365.
marginatus, *Halictoides*, 548.
 Panurgus, 548.
marginipennis, *Eunomia*, 546, 550.
Martinapis, 567.
Martinella, 567.
marylandensis, *Spilogale*, 503.
Mastacembelidae, 310.
Mastacembelus, 310.
 iberiensis, 310.
 marchei, 310.
Mastigomaldane filifera, 131.
Mastodont sp., 493.
Mastrucatobombus, 567.
mastrucatus, *Bombus*, 524, 567.
maura, *Andrena* (*Dactylandrena*), 543.
 Perdita, 608.
 Pérezia, 552, 587.
maurula, *Andrena*, 591.
maurus, *Halictoides*, 575.
 Panurgus, 575.
maxillosa, Apis, 537.
media, *Demonax*, 133.

- mediorufa*, *Trigona*, 581.
medius, *Sigmodon*, 481, 490, 491, 509, 510, 511.
Megabombus, 567.
megacephalus, *Ancaeus*, 88, 90.
 Lispinus, 90.
 Paralispinus, 85, 88, 90.
Megachille, 520, 522, 524, 528, 537, 543, 544, 545, 550, 551, 556, 563, 565, 567, 568, 569, 575, 583, 587, 593, 594, 607.
 africana, 530.
 (Berna) *africana*, 530.
 africaniba, 530.
 albitarsis, 522.
 bituberculata, 524.
 bombiformis, 555.
 bombycina, 550.
 brevis, 565.
 centuncularis, 567.
 chichimeca, 575.
 combusta, 546.
 cricetorum, 594.
 cristata, 594.
 detersa, 525.
 flavipes, 528.
 fortis, 587.
 frigida, 544.
 georgica, 554, 598.
 integra, 607.
 latimanus, 607.
 (Creightonella) *mitimia*, 541.
 montivaga, 543.
 nasicornis, 524.
 parallela, 528.
 (Xeromegachille) *pascoensis*, 545.
 petulans, 563.
 pruina, 593.
 pugnatus, 535, 598.
 (Sayapis) *pugnatus*, 554.
 rhodura, 556.
 rufimanus, 537.
 sjoestedli, 524.
 steloides, 591.
 tricarinatus, 578.
 variolosa, 576.
 vidua, 544.
 villosa, 528, 565.
 xylocopoides, 569.
 zapoteka, 541.
Megachiloides, 567.
 oenotherae, 567.
Megacilissa, 567, 568.
 gloriosa, 592.
 superba, 567.
Megalobombus, 567.
Megalochila, 568.
Megalocilissa, 567, 568.
Megalomma, 133.
 circumspectum, 101, 133.
Megalopta, 568.
 bituberculata, 568.
 (Megaloptidia) *contradicta*, 568.
 (Megaloptella) *ochria*, 568.
Megaloptella, 568.
Megaloptidia, 568.
Megalosmia, 568.
megalotis, *Reithrodontomys*, 508, 509.
Megandrena, 568.
Meganomia, 568.
Megapais, 568.
Megatylopus, 496, 497, 514.
 spatula, 496, 497, 514.
Meghyllaenus, 568.
Megilla, 568, 568.
 aterrima, 555.
 labiata, 566, 568.
 parvula, 578.
 smaragdula, 588.
Mehelya, 530, 569.
Mehelyana, 569.
melanantha, *Hesperonomada*, 557.
Melanapis, 569.
 violaceipennis, 569.
Melandrena, 569.
Melanempis, 569.
Melanobombus, 562, 569.
melanocarpa, *Caesalpinia*, 204.
Melanocentris, 569.
melanochroa, *Andrena* (*Micrandrena*), 573.
melanolomatus, *Luperodes*, 58, 63.
Melanomada, 569.
melanopleura, *Tilapia*, 340, 342, 344.
melanopterus, *Gerres*, 302.
melanorhinus, *Sceloporus*, 350.
 Sceloporus melanorhinus, 360, 361.
Melanosaurus, 569.
Melanosmia, 535, 569.
Melanostelis, 569.
 bethell, 569.
melanoxantha, *Chacoana*, 536.
melanura, *Palaeorhiza*, 558.
Melea, 569.
Melecta, 531, 570, 594, 602, 608.
 bicolor, 572.
 californica, 570.
 diacantha, 594.
 edwardsii, 570.
 histrionica, 541.
 maculata, 573, 608.
 mucida, 531.
 thoracica, 531.
Melectoides, 563, 570.
 senex, 570.
Melectomimus, 570.
Melectomorpha, 570.
Meliphila, 570.
 ipomoeae, 570.
Melipona, 570.
 bocandel, 570.
 fulva, 570.
 prosoipiformis, 585.
 testacea, 585, 586.
 testaceicornis, 575.
meliponoides, *Apis*, 547.
Meliponorytes, 570.
 succini, 570.
Meliponula, 570.
Melissa, 570, 573.
 diabolica, 543.
Melissina, 570.
 viator, 570.

- Melissoda**, 541, 571.
latreillei, 571.
Melissode, 571.
Melissodes, 547, 567, 571.
albata, 607.
atripes, 548.
bombiformis, 547.
compta, 521.
condigna, 553.
edwardsii, 551.
enavata, 545.
fonscolombel, 571.
fulvitaris, 602.
lutelcornis, 567.
nigrifrons, 540.
Melissoptila, 571.
tandilensis, 571.
Melitoma, 547, 570, 571.
euglossoides, 570, 571.
Melitome, 571.
Melitribus, 571.
greavesi, 571.
victoriae, 571.
Melitta, 531, 538, 561, 571, 593.
annularis, 562.
(Brachycephalapis) californica, 531.
labialis, 558.
minutula, 525.
nigriceps, 539.
nitida, 525.
ovatula, 602.
rubicunda, 556.
swammerdamella, 544.
tibialis, 538.
tricincta, 538, 561, 571.
trimmerana, 559.
xanthopus, 562.
Melittidia, 571, 572.
Melittoides, 571.
melittoides, *Andrena*, 571.
Coquillettapis, 540.
Dolichochile, 546.
Melittosmithia, 572, 600.
Melittoxena, 572.
Melitturga, 572.
Meliturga, 572.
Melitturgopsis, 572.
Melitturgula, 572.
braunsi, 572.
mellea, *Microdontura*, 573.
mellifica, *Apis*, 528.
Mellinus bipunctatus, 529, 560, 590, 591.
variegata, 575.
Mellitidia, 571, 572.
mellona, *Anthophorites*, 527.
melolontha, *Melolontha*, 162, 173, 174.
Melolontha, 159, 163, 174.
fervida, 162.
furcicaudata, 173.
hirticula, 161.
incana, 173.
lanceolata, 162.
leucophthalma, 165.
melolontha, 162, 173, 174.
pilosicollis, 162.
pubereus, 162.
Melolontha quercus, 162.
serrata, 164, 165.
tristis, 162.
virescens, 173.
Melolonthine beetles, descriptions of the larvae of some West Indian, and a key to the known larvae of the tribe, 167.
Mendacibombus, 572.
mendax, *Bombus*, 572.
mengel, *Bombusoides*, 531.
mento, *Gnathonemus*, 308, 310.
merescens, *Halictus*, 581.
Mermiglossa, 572.
rufa, 572.
Meroglossa, 572.
canaliculata, 572.
eucalypti, 572.
Meroglossula, 572.
Merychippus, 494.
Merycodus, 407, 482, 517.
Mesocheira, 572.
azurea, 570, 573.
bicolor, 572.
velutina, 559, 580.
Mesochira, 572.
Mesonychium, 573.
coerulescens, 573.
Mesoplia, 570, 573.
Mesotrichia, 573.
torrida, 573.
Metabolus, 157.
Metaglypus spatula, 496, 497, 514.
Metajapyx, 295.
schwarzi, 294.
metallica, *Rivallia*, 597.
metallicum, *Mydrosoma*, 575.
Temnosoma, 603.
metallicus, *Dasycolletes*, 544.
Metapsithyrus, 573.
Metarhyssa, 279.
bifasciata, 279, 280.
Meteorite, the Freda, N. Dak., a nickel-rich ataxite, 21.
metolca, *Trypanea*, 9.
Metylaeus, 573.
cribratus, 573.
mevarna, *Trypanea*, 14.
Trypanea, 4, 6 (fig.), 14.
Trypeta (*Urella*), 14.
mexicana, *Glycera*, 101, 111 (fig.), 128.
Juniperus, 406, 460, 463, 472, 473.
mexicanus, *Brachystracon*, 499.
Citellus, 506.
Epeicharis, 548, 553.
Hemipodus, 101, 126.
Mexico herpetological miscellany, 349.
Mexico and Tropical America, new species of bark beetles (*Pityophthorini*) from, 177.
micans, *Prosopalictus*, 590.
Xylocopa (*Schönherria*), 598.
Micralictoides, 573.
Micrandrena, 573.
pacifica, 573.
Micranthidium, 573.

- Micranthophora**, 573.
Micrapis, 573.
Micraugochlora, 573.
 sphaerocephala, 573.
microlephas, *Pachymelus*, 581.
microcephala, *Chrysopsis*, 15.
microcephalus, *Euprepis*, 369.
 Gerrhonotus, 370.
Microdontura, 573.
 mellea, 573.
Microlepidoptera, new species from
 Washington State, 267.
Micromelecta, 573, 608.
Micronomada, 574.
Micropalama hesternus, 480.
Micropanchax, 336.
 macrurus manni, 301, 334, 336.
microsetulosa, *Trypanea*, 4, 6, 17.
Microstellis, 574.
microstigma, *Trypanea*, 3, 6 (fig.), 11.
Microtrichia, 157.
 cotesi, 174.
micula, *Columba*, 480.
Mimulapis, 574.
 versatilis, 574.
mimus, *Phenacolletes*, 587.
 Polyblapis, 589.
mindanaoana, *Ancylonycha*, 165, 173,
 175.
minima, *Euryglossella*, 551.
minimus, *Baiomys*, 480, 488.
 Trilepeolus, 528.
minor, *Geomys*, 487.
 Neoterogeomys?, 480, 487, 488.
 Perognathus?, 507.
 Prodipodomys?, 480, 486.
 Sceloporus jarrovi, 360.
 Sigmodon, 481, 491, 510.
minuscula, *Anabernicula*, 479.
 Lumbriconereis, 102, 116.
 Lumbrineris, 102, 116, 121 (fig.).
minuta, *Dufourea*, 547.
 Lumbriconereis, 102, 116, 117.
minutissima, *Aplis*, 578.
 Nomloides, 578.
minutissimus, *Thoracophorus* (*Leipo-*
 phorus), 88.
minutula, *Andrena*, 525.
 Melitta, 525.
minutus, *Equus*, 494.
 Phiarus, 584.
 Phloeosinus, 418.
mirabilis, *Glyptapis*, 554.
 Neopasiphae, 575.
 Pachyprosopis, 582.
 Tetralonia, 605.
mirifica, *Tanupalama*, 516.
mitimia, *Megachile* (*Creightonella*),
 541.
mitis, *Osmia*, 522.
Mixojapyx barberi, 296.
 cooki, 295.
modesta, *Andrena*, 530.
 Nomada, 574.
modestus, *Gerrhonotus*, 364, 369.
 mojavensis, *Hexepeolus*, 558.
 mollis, *Chone*, 136.
 molokaiensis, *Pycnophion*, 289.
 Monia, 574.
 grisea, 574.
Monidia, 574.
Monilapis, 574.
Monilosmia, 574.
Monoecca, 574.
 brasiliensis, 574.
Monolepta, 57, 58.
 crucigera, 63, 66.
 pauperata, 58.
monorhabdus, *Luperodes*, 58, 61.
monosperma, *Juniperus*, 407, 462, 470,
 472, 473.
montana, *Nomadita*, 577.
 Osmia, 535.
 Stelis, 586.
montandoni, *Coelioxys*, 582.
montanus, *Celestus*, 374.
montezumae, *Pinus*, 211.
monticola, *Gerrhonotus*, 364.
montivaga, *Megachile*, 543.
 Osmia, 522.
Monumetha, 574.
 albrifrons, 574.
 argentifrons, 574.
moorei, *Lumbrineris*, 102, 116, 121 (fig.).
moratus, *Espeson*, 88.
Morawitzia, 574.
 panurgoides, 574.
moreletii, *Gerrhonotus*, 364.
morgani, *Eligmodontia*, 490.
Morgania, 574.
 gerstaeckeri, 574.
morio, *Andrena*, 569.
Mormyridae, 307.
Mormyrops breviceps, 307, 308.
 deliciosus, 307, 308.
Mormyrus goheeni, 307, 308.
morosa, *Ancylonycha*, 173, 174.
morsus, *Goniocolletes*, 555.
mosquito, *Trigona*, 588.
mossambicus, *Chromis*, 345.
mucida, *Melecta*, 531.
Mucidobombus, 552, 574.
 (*Exilobombus*) *exil*, 552.
 mucidus, 574.
mucidus, *Bombus*, 574.
 Mucidobombus, 574.
mucronata, *Lumbrineris*, 114.
 Notaulax, 102, 134.
mucronatus, *Potamethus*, 102, 134, 135
 (fig.).
 Sceloporus mucronatus, 357.
Mucuna fawcetti, 183.
 sp., 182.
mucunae, *Neodryocoetes*, 181.
muelleri, *Augochlora*, 579.
 Tetrapedia, 537, 545.
Mugil cephalus, 302.
 falcipinnis, 302.
multicarinata, *Gerrhonotus*, 365.
multicostata, *Diplopsis*, 88.
multifasciata, *Gerrhonotus*, 365.

- multiplex, Augochlora (Tetrachlora), 603.
 Halletus, 603.
 municipalis, Cyathocrinus ?, 152.
 Poteriocrinites, 152.
 Rhopocrinus, 152, 153, 154.
 muoti, Dufourea (Trillia), 606.
 muraria, Apis, 537, 567.
 Xylocopa, 537, 567.
 murina, Emphoropsis murihirta, 572.
 muscaria, Apis, 563.
 Centris, 563.
 muscorum, Apis, 538.
 Mustelid sp., 485.
 mycetoporiformis, Holosus, 84, 88.
 Holosus (*Relinda*), 84, 85, 88, 90.
 Mydrosoma, 575.
 metallicum, 575.
 Myeloborus, 177, 178, 190, 201.
 deleoni, 201.
 Myletes nurse, 316.

Nacacus, subg., 78, 82, 86, 88, 90.
 Nannippus, 483, 494.
 phlegon, 481, 482, 494 (fig.).
 Nannocharax, 313.
 fasciatus, 313, 314.
 intermedius, 313, 314.
 seyboldi, 301, 311, 313.
 taenia, 314.
 Nannotrigona, 575.
 nannus, Gerrhonotus, 365.
 nasalis, Xylocopa, 530.
 nascornis, Megachile, 524.
 nasoni, Andrena, 588.
 nasutum, Anthidium, 601.
 nasutus, Colletes, 596.
 natalensis, Crinoglossa, 541.
 natans, Harmopsidea, 101, 102.
 Lepidasthenia, 101, 102.
 Navicularia, 575.
 navicularis, Holosus (Holosus), 85, 90.
 Neaspilota, 1, 18.
 achilleae, 19.
 alba, 19.
 albidipennis, 19.
 brunneistigma, 19.
 dolosa, 19, 20.
 punctistigma, 19.
 signifera, 19.
 vernoniae, 18.
 neavel, Eupetersia, 551.
 nebraskensis, Cupidinimus, 487.
 nebrodes, Luperodes, 58, 64.
 Nectarodiaeta, 575.
 oliveirae, 575.
 neglecta, Blareolina, 530.
 Cnemarachis, 167, 170, 174.
 nellana, Rediviva, 579.
 Nellopisthus, 288.
 Neoceratina, 575.
 australensis, 575.
 Neochelynia, 575.
 pauillista, 575.
 Neocorynura, 532, 575.

 Neodryocoetes, 177, 178, 179.
 amazonicus, 181.
 busckii, 181, 192.
 caribaeus, 181, 185, 186, 187.
 columbianus, 181, 183.
 cubensis, 180, 181, 191.
 exquisitus, 181, 196.
 guianae, 181, 186.
 hoodi, 181, 187.
 hostilis, 181, 189.
 hubbardi, 181, 182.
 humilis, 181, 188.
 hymenaeae, 179, 181.
 insularis, 181, 194, 199.
 lenis, 181, 198.
 mucunae, 181.
 obscurus, 181, 183.
 pallidus, 181, 193.
 schedli, 181, 195.
 tabogae, 181, 184.
 tenuis, 181, 197.
 teres, 181, 190.
 Neofiber, 511.
 Neohalictoides, 575.
 Neojapyx *tropicalis*, 298.
 Neolosus, subg., 78, 88, 90.
 Neolarra pruinosa, 575.
 Neolebias, 315.
 unifasciatus, 312, 315.
 Neolispinus, 77, 88.
 crucifer, 88.
 Neolosus, subg., 78, 88, 90.
 Neomegachile, 575.
neomexicanus, Phloeosinus, 406, 460, 462, 463, 472, 473, 474.
 Neopasiphae, 575.
 mirabilis, 575.
 Neopasites, 554, 576.
 camla, 576.
 Neoperdita, 576.
 Neopityophthorus, 177, 180, 181, 195.
 exquisitus, 181.
 schedli, 181.
 teres, 181.
 Neopityophthorus, subg., 178, 181.
 Neoscirtetica, 523, 576.
 Neotheronia, 282.
 Neotoma cinerea, 491.
 fossilis, 481, 491.
 magister, 491.
 neotropica, Bicolletes, 530.
neotropicalis, Catajapyx, 298.
 Neotrypetes, 576.
 neo-zealandiae, Lumbrineris, 117.
 Nephthys circinata, 102, 113.
 lutrea, 113.
 macroura, 113.
 Nephthyidae, 113.
 Nephthys, 113.
 macroura, 102, 111 (fig.), 113.
 macroura peruana, 113.
 praetiosa, 113.
 virginis, 113.

- Nereis iricolor*, 124.
viridis, 112.
Nerterogeomys, 487, 507.
minor, 480, 487, 488.
persimilis, 480, 487, 488.
Neshylaeus, 576.
Nesoeupetersia, 576.
Nesohalictus, 576.
Nesoprosopis, 576.
nesoprosopoides, *Hylaeus* (*Neshylaeus*), 576.
Nesothrincostruma, 576.
Neshylaeus, 576.
nevadanus, *Equus*, 518.
Nevadensibombus, 577.
nevadensis, *Bombus*, 577.
Bremus, 577.
nevermanni, *Conophis*, 394, 395.
nicholsoni, *Stenotritus* (*Ctenocolletes*), 542.
niger, *Gobius*, 347.
Panurginus, 582.
nigerrimus, *Pasitomachtes*, 586.
nigra, *Banchogastra*, 288.
Euryglossa, 551.
Formica, 563.
nigri, *Notopterus* (*Xenomystus*), 306.
Xenomystus, 306.
nigriceps, *Andrena*, 539.
Melitta, 539.
nigricornis, *Gyrodroma*, 556.
Heriades, 556.
Trypana, 3, 5, 6 (fig.), 10, 12.
Urella, 10.
nigrifrons, *Diadasia*, 540.
Melissodes, 540.
nigrodigitatus, *Chrysichthys*, 328, 332.
Pimelodus, 332.
nigromarginatus, *Halictus*, 593.
niloticus, *Chromis*, 344.
Cyprinus, 318.
Eutropius, 327.
Hypophthalmus, 381.
Salmo, 315.
nitida, *Apis*, 525.
Chrysantheda, 533, 538.
Melitta, 525.
Paranomada, 584.
nitidipennis, *Lispinus* (*Lispinus*), 90.
nitidissimus, *Ancaeus*, 90.
Paralispinus, 83, 90.
nitidiuscula, *Andrena*, 578.
nitidiventris, *Trigona*, 563.
nitidus, *Phloeosinus*, 404, 432, 440, 472, 473.
Thoracophorus, 88.
Thoracophorus (*Stilbogastrus*), 88.
Nitocris, 577, 578.
Nobilibombus, 577.
nobilis, *Gerrhonotus*, 365.
nodicornis, *Cyathocera*, 549.
Notocolletes, 577.
dentatus, 577.
Nodulua, 577.
Nomada, 519, 557, 562, 574, 577.
americana, 578.
articulata, 578.
bella, 554.
erigeronis, 534.
fabriciana, 577.
gibba, 600.
grindellae, 569.
hatterfiana, 537.
histrio, 570.
integerrima, 587.
integra, 587.
luteola, 607.
modesta, 574.
obliterata, 557.
ruficornis, 577.
scatellata, 541.
schottii, 585, 596.
scutellaris, 541, 604.
succincta, 577.
superba, 558.
texana, 535.
truncata, 572.
variegata, 548.
Nomadita, 577.
montana, 577.
nomadoides, *Camptopoeum*, 601.
Nomadopsis, 577.
Nomadosome, 577.
Nomadula, 578.
Nomia, 522, 566, 568, 577, 578, 584, 592, 595.
(Meganomia) *binghami*, 568.
chalybeata, 584.
diversipes, 578.
flavilabris, 588.
Jörgensenii, 578.
nortoni, 522.
persimilis, 549.
(Macronomia) *platycephala*, 566.
triangulifera, 549.
(Reepenia) *variabilis*, 595.
Nomiapis, 578.
Nomlocolletes, 578.
nomioides, *Camptopoeum*, 601.
Nomioides, 534, 550, 578.
(Cellaria) *arnoldi*, 534.
minutissima, 578.
(Cellariella) *somalica*, 534.
variegata, 550.
nootkatensis, *Chamaecyparis*, 401, 404, 415, 441, 472, 473.
nortoni, *Nomia*, 522.
Notandrena, 578.
Notanthidium, 578.
Notaulax mucronata, 102, 134.
Noterlades, 578.
Nothosmia, 564, 578, 607.
Nothylaeus, 527, 578.
(Anylaeus) *aberrans*, 527.
Notocirrus zonata, 102, 125.
Notocolletes, 578.
heterodoxus, 578.
Notomelitta, 579.
Notopteridae, 306.

- Notopterus afer*, 306.
(Xenomystus) nigr, 306.
novaeangliae, *Perdita* (*Alloperdita*), 523.
nudus, *Thamnophthorus*, 178.
nurse, *Alestes*, 312, 316.
Brachyalestes, 316.
Myletes, 316.
Nybelinia palliata, 25, 31.
Nyctomelitta, 579.
Nylaeus, 560, 579.
nymphae, *Bombus*, 552.
oaxaca, *Gerrhonotus*, 364, 367, 368.
oberon, *Sceloporus jarrovi*, 360.
oberti, *Bombus*, 579.
Oterobombus, 579.
Obertobombus, 579.
obliterata, *Nomada*, 557.
oblongatum, *Anthidium*, 590.
obscura, *Viereckella*, 607.
obscurum, *Lepidophyma flavomaculatum*, 379.
obscurus, *Gerrhonotus*, 364, 369.
Neodryocoetes, 181, 183.
Ophicephalus, 345.
Rhizotrogus assimilis, 175.
obtusifolium, *Gnaphthalium*, 15.
occidentalis, *Colletes*, 532.
Diphaglossa, 532.
Drymobius margaritiferus, 381, 382, 383.
Equus, 513.
Juniperus, 407, 412, 431, 456, 468, 471, 472, 473.
Petersius, 312, 316.
Polyphylla, 175.
Thuja, 453, 464, 465, 472, 474.
Trypanea, 13, 17.
Urellia, 17.
occipitale, *Pachyanthidium* (*Trichanthidium*), 605.
oculor, *Lepidophyma smithii*, 378, 379, 380.
ochoterenai, *Gerrhonotus*, 364, 368.
ochracea, *Dasiapis*, 544.
ochrias, *Halictus*, 563.
Megalopta (*Megaloptella*), 568.
ocularis, *Luperodes*, 59, 71, 72.
oculata, *Audouinea*, 127.
oculinoxa, *Squilla*, 53, 55 (fig.).
Odocolleus, 517, 518.
sherdanus, 518.
sp., 481.
odoë, *Hepsetus*, 312, 315.
Salmo, 315.
Sarcodaces, 315.
Odontallctus, 579.
Odontochlora, 579.
odontogaster, *Osmia*, 522.
Odontostelis, 579.
Odyneropsis, 579.
holosericea, 579.
Oecophoridae, 274.
Oediscelis, 579, 591, 598.
prosopoides, 591.
Oediscelis (*Pseudiscelis*) *rostrata*, 593.
vernalis, 579.
oenotherae, *Megachiloides*, 567.
Oestropsis, 579.
pubescens, 554, 579.
ogilviei, *Rhinochaetula*, 556.
Systropha (*Systrophidia*), 602.
oleracea, *Euterte*, 195.
oligoporus, *Sceloporus horridus*, 361.
Oligotropus, 579.
campanulae, 579.
olisthaeriformis, *Holosus*, 84.
Holosus (*Relinda*), 84, 85, 90.
olivaceus, *Gerrhonotus*, 365.
oliveirae, *Nectarodiaeta*, 575.
oliveri, *Imantodes splendidus*, 388, 391.
olivieri, *Xylocopa*, 592.
Omachtes, 580.
capensis, 593.
capicola, 600.
carnifex, 580.
Omachthes, 558.
omiltemanus, *Sceloporus mucronatus*, 352, 355, 357.
Ondatra, 511.
idahoensis, 511.
sp., 481, 511.
zibethica, 511.
Onellella, 278.
rufopetiolata, 278.
Onychomys, 490, 508, 509.
bensoni, 481, 489, 490, 509.
leucogaster, 490.
leucogaster ruidosae, 509.
pedroensis, 480, 509.
torridus, 490.
Ooencyrtus, 41, 49, 50.
anabrivorus, 49.
opalina, *Apista*, 528, 547.
Opandrena, 580.
Ophelia denticulata, 102, 130.
limacina, 102, 130.
Opheliidae, 128.
Ophelina agilis, 102, 129.
maculata, 102, 129.
Opheltoideus, 289.
johnsoni, 289.
Ophicephalidae, 345.
Ophicephalus, 345.
obscurus, 345.
Ophichthus rufus, 302.
Ophichthys (*Sphagebranchus*) *büttikoferi*, 306.
ophiurus, *Gerrhonotus llocephalus*, 365, 369.
Opisthorhyssa, 279.
bifasciata, 279.
Opisoxestus, 280.
ferrugineus, 280, 281.
Opisthoxestus, 280.
Opuntia, 69.
opuntiae, *Heriades*, 528.
Perdita (*Lutziella*), 539, 566.
oraniensis, *Ancyla*, 525, 588.
Phileremus, 587.
Schmiedeknechtia, 598.

- orbiculare, *Phrynosoma*, 361.
orbignyi, *Trigona*, 606.
Orbitella, 551, 580.
ordii, *Dipodomys*, 486.
Oreichthys, 320.
Oreopasites, 580.
 scituli, 580.
oribazi, *Macroglossa*, 566.
Orientalibombus, 580.
orientalis, *Anoxia*, 164.
 Bombus, 580.
 Plesiothomomys?, 508.
ornata, *Praxillura*, 102, 131.
Orphana, 563, 580, 595.
 Inquilenda, 563, 580, 595.
Orthogeomys, 508.
Osiris, 551, 580.
 pallidus, 580.
Osmia, 522, 524, 528, 529, 536, 537, 549, 553, 556, 559, 564, 565, 568, 569, 580, 581, 606.
 albiventris, 564.
 andrenoides, 549.
 armaticeps, 535.
 (*Aspidosmia*) *arnoldi*, 529.
 bicornis, 524.
 bucephala, 535.
 canadensis, 574.
 claviventris, 564.
 conjuncta, 545.
 cordata, 607.
 distincta, 578.
 emarginata, 522.
 flavicornis, 601.
 fuciformis, 569.
 fulgida, 538.
 georgica, 555.
 grandis, 508.
 mitis, 522.
 montana, 535.
 montivaga, 522.
 odontogaster, 522.
 platycera, 528, 565.
 quadridentata, 545.
 rufa, 524, 581.
 (*Nothosmia*) *simillima*, 574.
 tricornis, 580.
 tridentata, 606.
 (*Atoposmia*) *triadonta*, 529.
 villosa, 565.
osmioides, *Halictus* (*Gastrohalictus*), 553.
Osoiriinae, 76, 77, 78, 84.
Osoiriinae and *Lispini*, notes on the classification of the staphylinid beetles of the groups, 75.
Osoirini, 76, 79, 83.
Osteology of Polyglyphanodon, an Upper Cretaceous lizard from Utah, 229.
Oterobombus oberti, 579.
Otobothrium, 30.
Otobothrium robustum, 30.
Otospermophilus, 485, 486, 506.
ovacula, *Andrena*, 602.
 Melitta, 602.
Oxaea, 544, 580.
 flavescens, 544, 580.
 gloriosa, 592.
Oxycetonia jucundo, 175.
Oxyhalictus, 580.
Oxyinedys, 559, 580.
 beroni, 580.
Oxyrhopus doliatus aequifasciata, 393.
 doliatus semicinctus, 393.
Oxystoglossa, 581.
 decorata, 581.
Oxytelinae, 75, 76.
Oxytrigona, 581.
Pachyanthidium, 573, 581, 605.
 (*Trichanthidium*) *occipitale*, 605.
 (*Micranthidium*) *truncatum*, 573.
Pachycentris, 581.
 schrottkyi, 581.
Pachycerapis, 581.
Pachycrepis, 46.
 lachni, 46.
Pachyhalictus, 581.
Pachylocrinidae, 151.
Pachylocrinus, 151, 153.
Pachymelopsis, 581.
Pachymelus, 581.
 conspicuus, 581.
 micrelephas, 581.
Pachyneuron, 46.
Pachyosmia, 524, 536, 580, 581.
pachyphloea, *Juniperus*, 406, 407, 413, 414, 446, 459, 460, 462, 470, 472, 474.
Pachyprosopis, 582.
 mirabilis, 582.
pacifica, *Micrandrena*, 573.
pacificus, *Equus*, 513.
Paedia, 582.
Paidia, 525, 582, 587.
Palaeorhiza, 582.
 giganteus, 568.
 melanura, 558.
Palinepeolus, 533, 582.
pallata, *Nybelinia*, 25, 31.
pallatus, *Tetrarhynchus*, 31.
pallidulus, *Luperodes*, 59, 68.
pallidus, *Neodryocetes*, 181, 193.
pallidus, *Osiris*, 580.
Palmaceae, 178.
palmas, *Polypterus*, 303, 304.
palmeri, *Gerrhonotus*, 365.
pamirus, *Subterraneobombus*, 579.
pannonica, *Dioxys*, 538.
Panurginus, 531, 555, 582, 599.
 albopilosus, 599.
 niger, 582.
 polytrichus, 531.
panurgoides, *Morawitzia*, 574.
Panurgomia, 582.
 fuchsi, 582.
Panurgus, 549, 582.
 aethiops, 594.
 andrenoides, 584.
 ater, 582.
 chalybaeus, 545.

- Panurgus, lustrans*, 557.
manifestus, 533.
marginatus, 548.
maurus, 575.
papaveris, Apis, 553, 587.
papilio, Perlophthalmus, 346.
Perlophthalmus koelreuteri, 346.
Papilio agamemnon, 43.
papillosa, Glycera, 126.
papuana, Eupalaeorhiza, 550.
Paraanthidium, 582, 591.
Parabates, 289.
Paracamelus, 496, 497, 514.
Paracentris, 582.
fulvohirta, 582.
Paracoelioxys, 564, 582, 583.
barrei, 583.
Paracolletes, 544, 558, 562, 566, 583.
(Heterocolletes) capillatus, 558.
crassipes, 583.
(Lysicolletes) singularis, 566.
Paracrocisa sinaitica, 583.
Paradoxys, 583.
paradoxa, Fidelia, 553.
Leptoglossa, 563, 595.
paradoxus, Halictoides, 535.
Prosopoides, 591.
Parafidelia friesei, 583.
Parafriesea, 553, 583.
Paragapostemon, 583.
Parahalictoides, 583.
Paralictus, 583.
Paralispini, 76, 77, 78, 79.
Paralispinus, 77, 81, 85, 88, 90.
californicus, 90.
exiguus, 80, 90.
megacephalus, 85, 88, 90.
nitidissimus, 83, 90.
planellus, 90.
polltus, 90.
prolixus, 90.
(Clavillispinus) siargaoanus, 88.
sp., 90.
parallela, Megachile, 528.
parallelus, Lispinus (Lispinus), 90.
Paramacropis, 583.
Paramegachile, 551, 583, 584.
Paramegalochila, 584.
Paramegilla, 584.
Parammobates, 584.
Paramphilius, 333.
freestonei, 301, 328, 333.
trichomycteroides, 333, 334.
Parandrena, 584.
Paranomada, 584.
nitida, 584.
Paranomia, 522, 578, 584.
Paranthidium, 584.
Parapolyglossa, 584.
Paraprosopis, 534, 584.
Parapsaenythia, 584.
Pararhophites, 585.
Parasabella sulfurea, 133.
Parasphecodes, 585.
briliensis, 527.
hilactus, 585.
texana, 600.
Parathrincostruma, 585.
seyrigi, 585.
Paratlapia büttikoferi, 343.
(Pelmatochromis) büttikoferi, 343.
(Pelmatochromis) jentinkii, 343.
Paratrigena, 585.
Paraugochlora, 529, 585.
Paraugochloropsis, 585.
Parepeolus, 585.
Parespeson, 88.
Parevaspis, 585.
basalis, 585.
pariana, Anthophila, 275.
Phalaena Tortrix, 275.
parnassiae, Zelleria, 276.
Partamona, 585, 586.
parva-pedata, Lumbriconereis, 102, 118.
Lumbrineris, 102, 115 (fig.), 118.
parvidens, Geomys, 507.
parvula, Apis, 578.
Hypochoerataenia, 560.
Megilla, 578.
parvus, Calliopsis, 558.
pascoensis, Megachile (Xeromegachile), 545.
Pasiphae, 531.
caerulescens, 585.
Pasites, 585.
dichroa, 574.
maculata, 585.
pilipes, 577.
punctatus, 530.
pygmaeus, 594.
Pasitomachtes, 586.
nigerrimus, 586.
Pateflapis, 586.
Patera, 585, 586.
patula, Pinus, 212.
paucicarinatus, Gerrhonotus, 365.
paulista, Neochelynia, 575.
pauperata, Monolepta, 58.
Pavostelis, 586.
pearcel, Platygonus, 495.
Pectina, 560, 586, 606.
pedroensis, Onychomys, 480, 509.
pedroensis, Spilogale, 475, 480, 502 (fig.).
Pelandrea, 586.
reducta, 586.
pelargoides, Perdita (Glossoperdita), 554.
Pellonula, 304, 305.
vorax, 304.
Pelmatochromis, 342, 343.
büttikoferi, 339, 342, 343.
caudifasciatus, 340, 344.
humilis, 339, 342, 343.
jentinkii, 339, 342, 343.
pendleburyi, Callomelecta, 533.
pentagona, Diaspis, 47.
pentamera, Hoplitella, 559.
Pentaperdita, 586.
Peponapis, 586.
Perca scandens, 345.
Perdita, 523, 554, 586, 587, 604.
albovittata, 586.
beata, 587.

- Perdita chamaesarachae*, 554.
halictoides, 586.
hyalina, 539.
laneae, 587.
larreae, 587.
latior, 567.
maura, 608.
 (Alloperdita) *novaeangliae*, 523.
 (Lutzella) *opuntiae*, 539, 566.
 (Glossoperdita) *pelargoides*, 554.
zebrata, 576.
zonalis, 577.
Perditella, 587.
Perditomorpha, 587.
bruneri, 587.
pereyrae, *Leptometria*, 563.
Pérezia, 552, 587.
maura, 552, 587.
peringueyi, *Andrena*, 595.
Rediviva, 595.
Periophthalmus, 346.
barbarus, 346.
koelreuteri, 346.
koelreuteri papillo, 346.
papillo, 346.
Perissodactyla, 494, 512.
pernigra, *Cyphomelissa*, 543.
Perognathus ? *minor*, 507.
sp., 480, 506.
Peromyscus, 489, 490.
eremicus anthonyi, 489.
maniculatus gambellii, 489.
sp., 480, 489.
truei truei, 489.
perotei, *Pityophthorus*, 218.
perpectum, *Anthidium*, 584.
Persea americana, 179.
pittieri, 179.
sp., 178.
persimilis, *Geomys*, 487, 507.
Netterogeomys, 480, 487, 488.
Nomia, 549.
persimulata, *Andrena* (*Gonandrena*), 555.
personatus, *Bothrys*, 88.
perspicuosus, *Ablerus*, 47.
peruana, *Nephtys macroura*, 113.
peruviana, *Trypanea*, 3, 6 (fig.), 8.
perviridis, *Prosopis*, 582.
Petaloproctus, 131.
flifer, 102, 119 (fig.), 131.
tenuis borealis, 131.
Petersius, 316.
occidentalis, 312, 316.
pethola, *Clella*, 391, 393.
Petrocephalus simus, 307, 309.
petrophilus, *Gobius*, 347.
petulans, *Megachile*, 563.
phaedra, *Halictomorpha*, 556.
Phalaena populella, 267.
Tortrix pariana, 275.
Phaenosauros, 587.
Phenacolletes, 587.
minus, 587.
Phiarus, 549, 525, 582, 587.
minutus, 584.
philadelphi, *Heriades*, 590.
philanthoides, *Psaenythia*, 592.
Sphegocephala, 601.
Phileremulus, 587.
vigilans, 587.
Phileremus, 525, 587.
abdominalis, 525, 582, 587.
 (Melanempis) *ater*, 569.
emarginatus, 530.
fulviventris, 554, 576.
illinoensis, 558.
kirbyanus, 525.
oraniensis, 587.
?productus, 559.
Philermus, 569.
Philoxanthus, 587.
phlegon, *Equus*, 494.
Hipparion, 494.
Nannippus, 481, 482, 494 (fig.).
Phloeosinus Chapuis, revision of the genus in North America (*Coleoptera*, *Scolytidae*), 397.
Phloeosinus, 397.
aciculatus, 406, 458, 459, 472, 473, 474.
alaskanus, 400, 409, 472, 474.
antennatus, 401, 415, 417, 419, 472, 474.
arizonicus, 402, 424, 472, 473.
baumanni, 398, 404, 437, 438, 439, 472, 473.
buckhorni, 403, 432, 472, 474.
canadensis, 406, 463, 465, 466, 472, 473, 474.
chamberlini, 407, 470, 472, 473.
chiricahua, 444, 472, 473, 474.
coronatus, 402, 416, 472.
cristatus, 398, 405, 443, 444, 445, 446, 447, 472, 473.
cupressi, 398, 404, 432, 437, 440, 441, 472, 473, 474.
deleoni, 405, 454, 472, 473.
dentatus, 405, 450, 451, 452, 464, 472, 473, 474.
enixus, 452, 453.
frontalis, 402, 421, 472, 473.
fulgens, 403, 427, 428, 429, 472, 474.
furnissi, 469, 472, 473, 474.
graniger, 452, 453.
granulatus, 399, 402, 419, 472, 473.
haagii, 452, 453.
hoferi, 401, 412, 472, 474.
hoppingi, 401, 411, 412, 413, 415, 419, 472, 473, 474.
juniperi, 405, 406, 455, 458, 460, 461, 472, 473.
kaniku, 404, 434, 472, 474.
keeni, 400, 401, 414, 472, 473.
minutus, 418.
neomexicanus, 406, 460, 462, 463, 472, 473, 474.
nitidus, 404, 432, 440, 472, 473.
piceae, 400, 408, 472, 474.
pini, 400, 407, 408, 409, 472, 474.
punctatus, 403, 429, 431, 433, 434, 435, 472, 474.

- Phloeosinus rubicundulus*, 408, 431, 434, 435, 473, 474.
rugosus, 407, 467, 473.
russus, 425, 426.
rusti, 404, 435, 473, 474.
scopulorum, 407, 465, 473, 474.
sequoiae, 405, 446, 448, 449, 450, 473, 474.
serratus, 406, 456, 473.
setosus, 402, 422, 424, 473, 474.
spinosus, 402, 417, 473.
splendens, 403, 428, 473, 474.
squamosus, 405, 448, 473, 474.
swaini, 402, 418, 421, 473.
tacubayae, 398, 407, 466, 473.
taxodii, 405, 450, 473, 474.
texanus, 406, 462, 473.
utahensis, 406, 458, 473, 474.
vandykei, 403, 425, 473, 474.
variolatus, 399, 404, 437, 438, 473.
 Phor, 587.
 Phrynosoma, 252.
 douglassii, 361, 362, 363.
 douglassii brachycercum, 362.
 orbiculare, 361.
 Phyllobrotica, 62.
 bivittata, 59.
 Phyllodoce, 110.
 arenae, 102, 109, 110.
 catenula, 102, 109.
 fragilis, 102, 111.
 magnaoculata, 102, 110, 111 (fig.).
 Phyllococidae, 109.
 Phyllophaga, notes on beetles related to, with descriptions of new genera and subgenera, 157.
 Phyllophaga, 157, 163, 167.
 barda, 160.
 bolacoides, 160.
 cribrosa, 161.
 crinitissima, 159, 160.
 ecostata, 158, 159, 160.
 farceta, 161.
 gigantissima, 158, 159.
 inversa, 160.
 lalanza, 158, 159.
 sp., 175.
 Phyllophaga, subg., 157, 161.
 Phyllopods, a new species from the southwestern short-grass prairies, 33.
 Phyllotoma, 553, 587.
 Physostetha, 588.
 Phytalus, subg., 157, 159, 161, 162.
 apicalis, 160.
 smithi, 160.
 Picea, 397.
 canadensis, 409, 411, 472, 474.
 piceae, *Phloeosinus*, 400, 408, 472, 474.
 picta, *Callomelitta*, 533.
 Sabella, 102, 136.
 pictipes, *Hylaenus*, 584.
 pictipes, *Prosopis*, 584.
 pictus, *Amphilius*, 328, 332.
 Stenocolletes, 601.
 Pleistini, 75.
 pilipes, *Apis*, 527, 589.
 Pasites, 577.
 pilliventris, *Euglossa*, 554.
 pilosa, *Anoxia*, 164, 174.
 pilosicollis, *Melolontha*, 162.
 Pimelodus auratus, 331.
 nigrodigitatus, 332.
 platychir, 332.
 pini, *Phloeosinus*, 400, 407, 408, 409, 472, 474.
 Pinus, 397.
 banksiana, 408, 472, 474.
 cembroides, 211, 214, 215.
 lawsoni, 216, 218.
 leiophylla, 203, 205, 206, 211, 220, 227.
 montezumae, 211.
 patula, 212.
 sp., 211.
 strobi, 472, 474.
 teocote, 214, 215, 219.
 virginiana, 40.
 pisonis, *Eleotris (Cullus)*, 347.
 Gobius, 347.
 Pithitis, 588.
 pittieri, *Persea*, 170.
 Pityoborus, 177, 202.
 comatus, 203.
 secundus, 202.
 tertius, 177, 202.
 Pityophilus, 177.
 Pityophthorini, new species from Mexico and Tropical America (Coleoptera, Scolytidae), 177.
 Pityophthoroides, 177, 178, 190.
 pu dens, 199, 200.
 robai, 200.
 Pityophthorus, 177, 188, 194, 205, 397.
 acutus, 218.
 alni, 209.
 anceps, 205.
 attenuatus, 222.
 auctor, 214.
 cacuminatus, 218.
 caelator, 214.
 ciliatus, 211.
 confertus, 219.
 coronarius, 220.
 costalimai, 223.
 crassus, 213.
 cribratus, 216.
 cuspidatus, 217.
 dimidiatus, 221.
 fortis, 223.
 hidalgoensis, 215.
 hubbardi, 215, 216.
 leiophyllae, 205.
 perotei, 218.
 pu dicus, 208.
 regularis, 206.
 rhois, 206, 207.
 rudis, 212.
 sambuci, 207.
 scalptor, 205.
 shannoni, 224.
 spadia, 219.

- Pityophthorus subopacus*, 210.
 virilis, 223.
 zeteki, 226.
plagiosus, *Conophis pulcher*, 395.
planellus, *Lisipinus*, 88, 90.
 Paralisipinus, 90.
 Pseudolisipinodes (Nacaeus), 82, 83, 88, 90.
planifrons, *Gerrhonotus*, 365, 367, 368.
Plastandrena, 588.
Platandrena, 588.
platycephala, *Nomia (Macronomia)*, 566.
platycera, *Osmia*, 528, 565.
platychir, *Pimelodus*, 332.
Platygonus, 495, 496.
 pearcei, 495.
 sp., 481, 495.
Platynopoda, 529, 588.
platyodon, *Carcharias*, 30.
Platysqualus tudes, 30.
Plebeia, 588.
Plesianthidium, 588.
 fulvopilosum, 588.
Plesiopanurgus, 588.
 cinerarius, 588.
Plesiothomomys ? orientalis, 508.
Plesippus, 482, 483, 513.
 idahoensis, 484.
 shoshonensis, 484, 495.
 sp., 481, 495.
pleuromelas, *Tilapia*, 340, 342, 344.
Pleuroneurophion, 288.
 hawaiiensis, 288.
Pliauchenia, 497.
plicata, *Thuja*, 426, 431, 433, 435, 437, 450, 472, 473, 474.
Pliohippus, 494, 495.
Plistotrichia, 525, 588.
Pluchea foetida, 19.
plumatus, *Ptilothrix*, 547, 595.
Plusia, 550, 588.
 superba, 588.
podager, *Halictus (Paragapostemon)*, 583.
Podalirius, 527, 563, 568, 584, 589.
 (*Paramegilla*) *ireos*, 584.
 quadrifasciatus, 523.
 vallorum, 527.
Podasys, 544, 589.
Poecilandrena, 589.
Poecilia spilauचना, 337.
Poecilobombus, 589.
Poecilocentris, 589.
Poecilomelitta, 589.
Poecilomelitta flavida, 589.
poinsetti, *Sceloporus*, 350, 355.
Pollicana, 589.
Polistes instabilis, 44.
politula, *Ctenoplectra (Ctenoplectrina)*, 542.
politus, *Ancaeus*, 90.
 Paralisipinus, 90.
Polyblaps, 589.
 minus, 589.
polyclona, *Trypana*, 13.
Polyglossa, 584, 589.
 albitarsis, 589.
 heterodoxa, 584.
Polyglyphanodon, an Upper Cretaceous lizard from Utah, osteology, 229.
 sternbergi, 230, 234 (fig.), 235 (fig.), 237 (fig.), 239 (fig.), 241 (fig.), 242 (fig.), 243 (fig.), 245 (fig.), 247 (fig.), 248 (fig.), 249 (fig.), 252 (fig.), 253 (fig.), 254 (fig.), 255 (fig.), 257 (fig.), 258 (fig.), 259 (fig.), 260 (fig.), 262 (fig.).
Polyglyphanodontidae, 230.
Polynoë alba, 102, 103.
 lucida, 102, 103.
Polynoidae, 102.
Polyphylla, 162, 163.
 crinita, 175.
 decemlineata, 175.
 gracilis, 164.
 occidentalis, 175.
 variolosa, 175.
Polypteridae, 303.
Polypterus, 304.
 büttikoferi, 304.
 lowei, 303, 304.
 palmas, 303, 304.
Polysphinctomorpha, 288.
 luggeri, 288.
polytrichus, *Panurginus*, 531.
Pomobombus, 589, 596.
pomorum, *Bombus*, 589.
 Bremus, 589, 596.
popenoei, *Luperodes*, 59, 70.
populella, *Anacamptis*, 267.
 Phalaena, 267.
portoricensis, *Cnemarachis*, 167, 170, 174.
Potamethus, 134.
 elongatus, 102, 134, 135 (fig.).
 mucronatus, 102, 134, 135 (fig.).
 scotiae, 134.
 spathiferus, 134.
Potamilla californica, 102, 133.
 elongata, 102, 134.
 malmgreni, 134.
Poteriocrinites municipalis, 152.
Poteriocrinus proboscidiialis, 153.
 (*Scaphiocrinus*) *proboscidiialis*, 153.
praetiosa, *Nephtys*, 113.
pratensis, *Vespa*, 538.
Pratobombus, 589.
pratorum, *Apis*, 589.
pratti, *Sphecodosoma*, 601.
Praxillura, 131.
 ornata, 102, 131.
Presbia, 590.
Pressibombus, 590.
pressus, *Bremus (Pressihombus)*, 590.
pretiosa, *Synaspidia*, 49.
prezygus, *Sceloporus*, 354, 355, 356.
princeps, *Gnorimoschema*, 268.
 Lita, 268.
principis, *Gerrhonotus*, 365.

- Prionchirus*, 79.
pristina, *Brachyprotoma*, 503.
Pristipoma jubelini, 303.
Proanthidium, 590.
Proboscidea, 493, 512.
proboscidialis, *Poteriocrinus*, 153. ♀
Poteriocrinus (*Scaphiocrinus*), 153.
Rhopocrinus, 153, 154.
Procamelus coconinensis, 514.
 sp., 515.
Prochelostoma, 590.
Prochenia, 516.
Procoileus edensis, 518.
Prodioxys, 590.
 cinnabarina, 590.
Prodiplomys kansensis, 486.
 ? *minor*, 480, 486.
producta, *Alcidamea*, 523.
productus, *Phileremus*, 559.
 Trypetes, 576.
prolixus, *Ancaeus*, 90.
 Lispinus, 90.
 Paralispinus, 90.
pronitens, *Titusella*, 604.
propinqua, *Andrena*, 599.
Prosopalictus, 590.
 micans, 590.
prosopiformis, *Melipona*, 585.
 Trigona (*Paratrígona*), 585.
Prosopis, 521, 529, 530, 534, 538, 544, 552,
 559-562, 575, 584, 586, 590, 591.
 593, 600, 605, 606.
 annularis, 562.
 annulata, 560, 586, 606.
 bifasciata, 593.
 bifasciatus, 561.
 bipunctatus, 529.
 brevicornis, 544.
 cornuta, 521.
 curvica rinata, 544.
 euxantha, 554.
 facilis, 576.
 friesel, 530, 569.
 frontalis, 534.
 heraldica, 578.
 husela, 551.
 hyalinata, 600.
 perviridis, 582.
 pictipes, 584.
 quadrícornis, 559.
 variegata, 575.
 xanthopoda, 554.
Prosopistemon, 591.
 scrotinellum, 591.
prosopoides, *Oediscelis*, 591.
Prosopoides, 591.
 paradoxus, 591.
Protandrena, 530, 591.
Protandrenopsis, 591.
 fuscipennis, 591.
Protanthidium, 591.
 rufobalteatum 591.
Protepeolus, 591.
 singularis, 591.
Proteraner, 591.
Proterlades, 591.
Protobombus, 592.
 indecisus, 592.
Protodiscelis, 592.
 fiebrigi, 592.
Protohippus, 494.
Protomelecta, 592.
 brevipennis, 592.
Protomelissa, 592.
 iridescens, 592.
Protosmia, 592.
Protostelis, 592.
Protoxaea, 592.
Proxycopa, 592.
pruina, *Megachile*, 593.
pruinosa, *Macrocera*, 586.
 Neolarra, 575.
Psaenythia, 565, 584, 592.
 (*Parapsaenythia*) *argentina*, 584.
 philanthoides, 592.
psaenythioides, *Eulonchopria*, 550.
Psammolyce, 106, 108, 109.
 flava, 101, 105 (fig.), 108, 109.
Psettus sebac, 303.
Pseudagapostemon, 592.
Pseudapis, 592.
 anomala, 592.
Pseudaugochloropsis, 593.
Pseudoleusis, 79.
Pseudepeolus, 593.
 fasciatus, 593.
Pseudhylaesus, 593.
Pseudiscelis, 593.
Pseudoanthidium, 593.
Pseudobranchiata, 561, 593.
Pseudocentron, 593.
Pseudocillisa, 593.
Pseudococcus sp., 49.
Pseudocosmia, 593, 594.
Pseudodichroa, 593.
Pseudolispinodes, 77, 79, 82, 83, 85, 86,
 88, 89.
 aethiops, 82.
 (*Liberiella*) *aethiops*, 89.
 (*Pseudolispinodes*) *beesoni*, 89.
 (*Pseudolispinodes*) *birmanus*, 89.
 bistriatus, 80, 81, 90.
 (*Pseudolispinodes*) *castaneus*, 89.
 (*Pseudolispinodes*) *coarcticollis*, 89.
 (*Liberiella*) *cooki*, 81, 86, 88, 89.
 (*Pseudolispinodes*) *curtipennis*, 89.
 (*Liberiana*) *femoralis*, 82, 86, 88,
 89.
 (*Pseudolispinodes*) *fulvus*, 89.
 (*Pseudolispinodes*) *impar*, 89.
 (*Pseudolispinodes*) *impressicollis*,
 89.
 (*Pseudolispinodes*) *jyeri*, 89.
 latiusculus, 79.
 (*Rumeba*) *lispinoides*, 82, 87, 88, 90.
 longipennis, 79, 90.
 (*Pseudolispinodes*) *luzonicus*, 89.
 madurensis, 80, 81, 88.
 (*Nacaeus*) *planellus*, 82, 83, 88, 90.
 selangorensis, 80.
 (*Pseudolispinodes*) *selangorensis*,
 89.

- Pseudolispinodes** (*Pseudolispinodes*)
sericelventiris, 89.
sinuatus, 79, 80, 90.
sp., 90.
 (*Liberiella*) *sp.*, 89.
 (*Pseudolispinodes*) *sp.*, 89.
 (*Pseudolispinodes*) *specularis*, 89.
 (*Pseudolispinodes*) *subopacus*, 89.
 (*Pseudolispinodes*) *tenellus*, 89.
Pseudolispinodes, subg., 78, 81, 89.
Pseudomegachila, 594.
Pseudomegachille, 594.
Pseudomegalochila, 594.
Pseudomelecta, 594.
Pseudopanurgus, 591, 594.
Pseudopasites, 594.
Pseudopityophthorus, 178.
asperulus, 199.
Pseudopotamilla intermedia, 133.
Pseudosmia, 593, 594.
Psithyros, 527.
Psithyrus, 523, 527, 528, 547, 552, 561, 573, 594.
ashtoni, 528.
barbutellus, 523.
campestris, 573.
fernaldae, 552.
Pterobothrium filicollis 31.
malleum, 31.
Pteromalidae, 45.
Pteromalus cavus, 45.
Pterandrena, 594.
Ptilandrena, 594.
Ptiloglossa, 594.
ducalis, 594.
Ptilopoda, 594.
Ptilothrix, 547, 595.
plumatus, 547, 595.
Ptilotopus, 595.
americanorum, 595.
Ptilotopus, 595.
Ptoleglossa, 580, 595.
pubera, *Holotrichia*, 165.
pubereus, *Melolontha*, 162.
pubescens, *Oestropsis*, 554, 579.
pudens, *Pithophthoroides*, 199, 200.
pudicus, *Pityophthorus*, 208.
pugnatus, *Megachile*, 535, 598.
pugnatus, *Megachile* (*Sayapis*), 554.
pulchella, *Andrena*, 578, 594.
pulcher, *Conophis pulcher*, 395.
pulchra, *Euglossa*, 549, 550.
Townsendiella, 605.
punica, *Didonia*, 546.
punctata, *Apis*, 570, 602.
Centris, 570, 602.
Laonome, 102, 132.
Lumbrineris, 117.
Stictonomia, 601.
punctatissimus, *Luperodes*, 59, 73.
punctatus, *Epeolus*, 587.
Pasites, 580.
Phloeosinus, 403, 429, 431, 433, 434, 435, 472, 473, 474.
Puncticolletes, 595.
punctipennis, *Coelioxides*, 539.
punctistigma, *Neaspilota*, 19.
punctulatissima, *Apis*, 535, 555, 601, 605.
Puntius (*Barbodes*) *ablades*, 326.
 (*Barbodes*) *trispilus*, 324.
purpureus, *Hypscomus*, 102, 133.
purus, *Haliectus*, 529.
pustulosus, *Hydrosaurus*, 235.
Pycnophlon, 289.
molokaiensis, 289.
pygmaeus, *Pasites*, 594.
pyrella, *Swammerdamia*, 276.
Tinea, 276.
pyrenaica, *Diphysis*, 546.
pyri, *Zelleria*, 275.
Pyrobombus, 595.
Pyrrhobombus, 595.
Pyrrhomelecta, 595.
quadratus, *Rhopites* (*Pararhopites*), 585.
quadriceinta, *Apis*, 556.
quadricollis, *Lispinus* (*Lispinus*), 90.
quadricornis, *Prosopis*, 559.
quadridentata, *Apis*, 539.
Osmia, 545.
quadrifasciata, *Anthophora*, 524.
Hoplonomia, 559.
quadrifasciatus, *Apis*, 523.
Podalirius, 523.
quadrimalculata, *Apis*, 562.
quadrinotatus, *Lispinus* (*Lispinus*), 90.
quercus, *Melolontha*, 162.
Querquedula, *sp.*, 479.
quinquespinosa, *Rophites*, 597.
radifera, *Trypanea*, 3, 6 (fig.), 11.
Urellia, 11.
radula, *Galgela*, 376, 380.
ralunensis, *Sphecodes* (*Callosphcodes*), 533.
ranunculi, *Sphecodes*, 591.
Raphidostoma, 537, 595.
ceanothi, 595.
rapunculi, *Heriades*, 557.
ratzeburgi, *Hypsicamara*, 46.
rectangulata, *Euryglossidia*, 551.
Recurvaria lunaris, 274.
Rediviva, 595.
neliana, 579.
peringueyi, 595.
reducta, *Pelandrena*, 586.
Reepenla, 595.
regularis, *Pityophthorus*, 208.
Reithrodontomys, 508, 509.
megalotis, 508, 509.
religiosa, *Abies*, 213.
Relinda, subg., 77, 83, 88, 90.
renitantly, *Thrinchostoma*, 604.
reticulata, *Dipsas cenchoa*, 385.
retusa, *Apis*, 527.
Rhathymus, 540, 564, 595.
bicolor, 564, 595.
Rhineta, 530, 596.
Rhinetaula, 596.
denticrus, 596.
Rhinochaetula, 596.
ogilviei, 556.

- Rhinocolletes*, 596.
Rhinocorynura, 596.
Rhizotrogus, 157, 165.
 assimilis obscurus, 175.
 majalis, 175.
 solstitialis, 175.
 (*Amphimallon*) *solstitialis*, 164.
Rhodanthidium, 596.
Rhodine, 132.
 bitorquata, 102, 132.
Rhodobombus, 589, 596.
Rhodocentris, 555, 558, 596.
rhodognatha, *Ashmeadiella*, 537.
rhodura, *Megachile*, 556.
rhois, *Pityophthorus*, 206, 207.
rhombeata, *Dipsas cenchoa*, 384.
rhombifer, *Gerrhonotus*, 365.
Rhopalictus, 575, 596.
rhopalocera, *Thyreothremma*, 604.
Rhopalomelissa, 596.
 xanthogaster, 596.
Rhopalopherus, 88.
 gestroi, 88.
Rhopites, 585, 596, 597.
 canus, 597.
 (*Pararhopites*) *quadratus*, 585.
Rhopitoides, 597.
 distinguendus, 597.
Rhopitulus, 597.
 friesel, 597.
 frisel, 597.
Rhopocrinus, 151, 152.
 municipalis, 152, 153, 154.
 proboscidiialis, 153, 154.
 spinosus, 152, 153.
rigidae, *Aroga*, 274.
Rivallia, 597.
 metallica, 597.
rivipacis, *Boreostracon*, 499.
robai, *Pityophthoroides*, 200.
robili, *Halticus* (*Nesohalticus*), 576.
Robertsonella, 597.
 gleasoni, 597.
 simplex, 597.
robusta, *Cilissa*, 593.
 Drilonereis, 102, 119 (fig.), 125.
 Laranda, 102, 125.
 Leanira, 102, 104, 105 (fig.).
 Lumbrineris, 119.
Robustobombus, 597.
 robustus, 597.
robustum, *Otobothrium*, 30.
robustus, *Alpigenobombus*, 597.
 Bombus, 597.
 Robustobombus, 597.
roceltella, *Filatima*, 271.
Rodentia, 485, 505.
Romerolagus, 492.
Rophites, 585, 596, 597.
 quinquespinosa, 597.
rostrata, *Oediscelis* (*Pseudiscelis*), 593.
Rostratilapis, 597.
rozellae, *Celestus*, 372, 374.
rubi, *Chelynia*, 569.
 Stella, 569.
rubicunda, *Melitta*, 556.
Rubicundobombus, 597.
 rubicundus, 597.
rubicundulus, *Phloeosinus*, 403, 431, 434, 435, 473, 474.
rubicundus, *Bombus*, 597.
 Fervidobombus, 597.
 Rubicundobombus, 597.
rubifloris, *Chelynia*, 537.
rubriventris, *Chilicola*, 537.
rudicollis, *Gerrhonotus*, 365, 368.
rudis, *Pityophthorus*, 212.
rufa, *Apis*, 524, 536, 580, 581.
 Mermiglossa, 572.
 Osmia, 524, 581.
rufescens, *Alphaneura*, 523.
ruficaudus, *Halticoides*, 573.
ruficeps, *Trichiothecus*, 285.
ruficollis, *Macrocera*, 566.
ruficornis, *Apis*, 577.
 Nomada, 577.
rufifloris, *Chelostomopsis*, 595.
 Chelynia, 595.
rufimanus, *Megachile*, 537.
Rufipedibombus, 597.
 rufipes, 597.
rufipes, *Bombus*, 597.
 Rufipedibombus, 597.
 Zacasta, 603.
rufiventris, *Ammobates*, 524.
rufobalteatum, *Protoanthidium*, 591.
rufocaerulea, *Brachyglossa*, 531.
rufogastra, *Allodape*, 523.
rufopetiolata, *Onellella*, 278.
rufus, *Canis*, 500, 501.
 Ophichthus, 302.
rugifrons, *Chelostoma*, 537.
rugipennis, *Imperodes*, 59, 68.
rugosa, *Andrena*, 605.
rugosum, *Thysanoccephalum*, 25, 26 (fig.).
rugosus, *Phloeosinus*, 407, 467, 473.
rudosae, *Onychomys leucogaster*, 509.
Rumcha, subg., 78, 82, 88, 90.
rupestris, *Apis*, 527, 594.
russus, *Phloeosinus*, 425, 426.
rusti, *Phloeosinus*, 404, 435, 473, 474.
rustica, *Apis*, 535, 548.
 Epicharis, 548.
rutilus, *Alestes*, 312, 316.
Sabella indica, 132.
 picta, 102, 136.
Sabellastarte, 132.
 indica, 102, 132.
Sabellidae, 132.
Sabullicola, 597.
Sabullicola cirsi, 597.
sabulosus, *Lipanthus*, 565.
saccharicola, *Blepyrus*, 47.
salae, *Clarias*, 326, 328.
Salix, 46, 267.
Salmo niloticus, 315.
 odoë, 315.
salvadorensis, *Gerrhonotus*, 364.
salviae, *Lasius*, 563.
salvinii, *Sceloporus malachiticus*, 356.

- Samba, 597.
 calcarata, 597.
sambucti, Pityophthorus, 207.
Sambucus sp., 208, 209, 221.
sanctae martaе, Sigmodon, 490, 491, 510.
 Sandhouse, Grace A., on the type species of the genera and subgenera of bees, 519.
Sangamona fugitiva, 518.
sanguinea, Eulalia, 112.
 Eumida, 101, 105 (fig.), 112.
 San Pedro Valley, Ariz., late Cenozoic vertebrate faunas from, 475.
Sarcodaces odoё, 315.
Sardis (Georgia) meteorite, 141.
sargentii, Cupressus, 402, 404, 419, 424, 439, 440, 473.
Sarogaster, 554, 598.
Saropoda, 542, 598.
 bombiformis, 528.
Sarotes, 598.
sarsi, Lumbrineris, 123.
Sauria, 230.
savagei, Tilapia, 341, 342, 345.
saxorum, Lithandrena, 565.
Sayapis, 535, 554, 598.
sayi, Dianthidium, 545.
 Saylor, Lawrence W., on beetles related to *Phyllophaga Harris*, with descriptions of new genera and subgenera.
scalptor, Pityophthorus, 205.
scandens, Perca, 345.
scatellata, Nomada, 541.
Scaura, 598.
Sceloporus, 252, 349.
 acanthinus, 355.
 asper, 351, 356.
 ferrariperezi ferrariperezi, 359.
 formosus, 349, 351, 354, 355.
 formosus formosus, 352, 353, 354, 356.
 formosus *scitulus*, 352, 356.
 horridus horridus, 361.
 horridus oligoporus, 361.
 jarrovii, 350, 359.
 jarrovii immucronatus, 359, 360.
 jarrovii jarrovii, 360.
 jarrovii minor, 360.
 jarrovii oberon, 360.
 jarrovii *sugillatus*, 357, 359, 360.
 lunaei, 355, 356.
 malachiticus acanthinus, 356.
 malachiticus malachiticus, 356.
 malachiticus salvinii, 356.
 malachiticus smaragdinus, 356.
 malachiticus taeniocnemis, 356.
 melanorhinus, 350.
 melanorhinus acanthinus, 351.
 melanorhinus *calligaster*, 360.
 melanorhinus melanorhinus, 360, 361.
 mucronatus *aureolus*, 356.
 mucronatus mucronatus, 357.
 mucronatus omiltemanus, 352, 355, 357.
 poinsettii, 350, 355.
Sceloporus prezygus, 354, 355, 356.
 serrifer, 355.
 spinosus, 350, 355.
 stejnegeri, 350, 356.
schedli, Neodryocoetes, 181, 195.
 Neopityophthorus, 181.
Schizandrena, 598.
schlegelii, Hemirhamphus, 302.
Schmiedeknechtia, 598.
 oraniensis, 598.
Schöherria, 598.
schottii, Nomada, 585, 596.
Schrottkeya, 562, 598.
schrottkeyi, Pachycentris, 581.
 Schultz, Leonard P., on the fresh-water fishes of Liberia, 301.
 schultzei, Haliectus (Patellapis), 586.
schwarzi, Euryrhopalus, 49.
schwarzi, Metajapyx, 294.
schwarzi, Thamnophthalmus, 178.
scincicauda, Gerrhonotus, 365.
Scincus ventralis, 370.
Scirtetica, 523, 558, 576, 598.
 antarctica, 523, 558, 576, 598.
scituli, Oreopasites, 580.
scitulus, Sceloporus formosus, 352, 356.
Scolytidae, new species of bark beetles (*Pityophthorini*) from Mexico and Tropical America (Coleoptera), 177.
scopulorum, Juniperus, 407, 413, 462, 466, 472, 473, 474.
 Phloeosinus, 407, 465, 473, 474.
scotiae, Potamethus, 134.
scotti, Eupetersia, 576.
 Sphecodes, 576.
Scrapter, 599, 602.
 bicolor, 599.
 brullei, 599.
 carinata, 572, 600.
 lagopus, 599.
Scrapteroides, 599.
 difformis, 599.
Scrapteropsis, 599.
scripta, Euglages, 549.
scrotinellum, Prosopistemon, 591.
scutellaris, Nomada, 541, 604.
seali, Streptocephalus, 33, 36, 37, 38.
sebae, Psettus, 303.
secundus, Pityoborus, 202.
Seladonia, 599.
seladonius, Apis, 599.
 Haliectus, 599.
selangorensis, Lispinus, 89.
 Pseudolispinodes, 80.
 Pseudolispinodes (Pseudolispinodes), 89.
sellatus, Camptotypus, 285.
semicinctus, Oxyrhopus dollatus, 393.
semifasciatus, Imantodes cenchoa, 385.
semiflavus, Luperodes, 65.
semiplicatus, Equus, 512.
semipurpurea, Euryglossa, 551.
semipurpurella, Eriocrania, 276.
 Lampronia, 276.
semirubra, Heriades, 591.
sempervirens, Sequoia, 405, 443, 448, 472, 473, 474.

- senegalensis*, Belone, 302.
Clupea, 304.
Cynoglossus, 303.
senex, *Bombus*, 599.
Melectoides, 570.
Senexibombus, 599.
Separatobombus, 599.
separatus, *Bombus*, 599.
Bremus, 599.
Sequoia, 397, 404.
sempervirens, 405, 443, 448, 472, 473, 474.
washingtoniana, 432, 473, 474.
sequoiae, *Phloeosinus*, 405, 446, 448, 449, 450, 473, 474.
Serapis, 599.
denticulatus, 599.
Serapista, 599.
Serica, 175.
sericea, *Andrena*, 564.
Apis, 564.
sericeiventris, *Lispinus*, 89.
Pseudolispinodes (*Pseudolispinodes*), 89.
serrata, *Bicornella*, 530.
Melolontha, 164, 165.
serratulae, *Trachusa*, 605.
serratus, *Hylesinus*, 456.
Juniperus, 459.
Phloeosinus, 406, 456, 473.
serricorne, *Thrinchostoma* (*Nesothrinchostoma*), 576.
serrifer, *Sceloporus*, 355.
setosus, *Phloeosinus*, 402, 422, 424, 473, 474.
sexcinctus, *Hylaeus*, 556.
sexfasciatus, *Epiplatys*, 335, 337.
sexmaculata, *Tetraperdita*, 604.
seyboldi, *Nannocharax*, 301, 311, 313.
seyrigi, *Parathrinchostoma*, 585.
shannoni, *Pityophthorus*, 224.
Sharks, Florida, some cestodes from, 25.
shastensis, *Gerrhonotus*, 365.
sheridanus, *Odocoileus*, 518.
shoshonensis, *Plesippus*, 484, 495.
siargaoanus, *Paralispinus* (*Clavilispinus*), 88.
Sibiricobombus, 599.
sibiricus, *Apis*, 599.
sibiricus, *Bombus*, 599.
siculum, *Anthidium*, 596.
Siderolamprus enneagrammus, 370.
Sigalloniidae, 104.
Sigmodon, 490, 509.
curtisi, 481, 509, 510.
hispidus, 491, 509.
medius, 481, 490, 491, 509, 510, 511.
minor, 481, 491, 510.
sanctae martaе, 490, 491, 510.
signata, *Sphex*, 560, 590, 591.
signator, *Sphex*, 590, 591.
signatus, *Hylaeus*, 560.
signifera, *Neaspilota*, 19.
silex, *Barilius*, 301, 347, 348.
Siluridae, 301, 326.
Silurus electricus, 331.
silvestrii, *Azotus*, 47.
Trigona, 553.
Simandrena, 599.
similis, *Conophis pulcher*, 395.
Streptocephalus, 38.
simillima, *Osmia* (*Nothosmia*), 574.
Simonycteris stocki, 476, 480, 497.
simplex, *Anabrus*, 51.
Heriades, 597.
Robertsonella, 597.
simus, *Petrocephalus*, 307, 309.
sinaítica, *Paracrocia*, 583.
singularis, *Paracolletes* (*Lysicolletes*), 566.
Protepeolus, 591.
sinuatus, *Holosus*, 80, 90.
Lispinus, 83.
Lispinus (*Spinilus*), 84, 90.
Longispinus, 80.
Pseudolispinodes, 79, 80, 90.
sitkensis, *Bombus*, 589.
sjoestedii, *Megachile*, 524.
smaragdina, *Thalestria*, 604.
smaragdinus, *Sceloporus malachiticus*, 356.
smaragdula, *Apis*, 588.
Megilla, 588.
Smith, Hobart M., on Mexican herpetological miscellany, 349.
smithi, *Clemora*, 167, 171, 172, 174.
Phytalus, 160.
Smithia, 572, 600.
smithii, *Lepidophyma smithii*, 378, 379, 380.
solaris, *Trypeta*, 14.
Solenopalpa, 600.
Solenopalpa fertoni, 600.
Solidago, 16.
solstitialis, *Rhizotrogus*, 175.
Rhizotrogus (*Amphimallon*), 164.
somalica, *Nomioides* (*Cellariella*), 534.
Sophrombus, 600.
fatalis, 600.
soporator, *Bathygobius*, 346, 347.
Gobius, 347.
Mapo, 347.
sordida, *Diploptaxis*, 163, 173.
Soroceensibombus, 561, 600.
soroceensis, *Apis* 561, 600.
Bombus, 600.
spadia, *Pityophthorus*, 219.
sparrmanni, *Tilapia*, 344.
Sparus galliaeus, 344.
spathiferus, *Potamethus*, 134.
spatula, *Megatylopsus?*, 496, 497, 514.
Spatularia, 600.
Spatulariella, 600.
Spatularis, 600.
specularis, *Lispinus*, 89.
Pseudolispinodes (*Pseudolispinodes*), 89.
Spermophthorus, 177, 178, 208.
apuleiae, 204.
caesalpiniae, 203.
Sphaerhyla, 600.
sphaerocephala, *Micraugochlora*, 573.

- Sphagebranchus* 306,
 cephalopeltis, 306.
Sphécodes, 533, 545, 597, 600.
 antennariae, 545.
 antipodes, 531.
 falcifer, 547.
 (*Callosphécodes*) *ralunensis*, 533.
 ranunculi, 591.
 scotti, 576.
 stygius, 566.
 texana, 600.
Sphécodium, 600.
 cressonii, 600.
Sphécodogastra, 600.
Sphécodopsis, 594, 600.
Sphécodosoma, 601.
 pratti, 601.
Sphécophala, 601.
Sphégocephala, 601.
 philanthoides, 601.
Sphex *gibba*, 545, 600.
 signata, 560, 590, 591.
 signator, 590, 591.
sphingis, *Cryptus*, 277.
 Zonocryptus, 278.
Sphinx *chrysalis*, 279.
Sphyrna *zygaena*, 31.
spilauchen, *Aplocheilus*, 337.
 Epiplatys, 335, 337.
 Haplocheilus, 337.
spilauchena, *Poecilia*, 337.
Spilogale, 504.
 ambigua, 502, 503.
 arizonae, 502, 503.
 gracilis, 502.
 marylandensis, 503.
 pedroensis, 475, 480, 502 (fig.).
spilloptera, *Colletes*, 594.
spiniferus, *Cryptohalictoides*, 541.
Spinitus, subg., 78, 83, 88, 90.
spinolae, *Augochlora*, 529, 585.
 Colletes, 565.
Spinolella, 539, 601.
Spinolella *euxantha*, 539.
spinosus, *Phloeosinus*, 402, 417, 473.
 Rhopocrinus, 152, 153.
spinus, *Sceloporus*, 350, 355.
pinulosa, *Apis*, 559.
piralis, *Andrena*, 602.
plendens, *Phloeosinus*, 403, 428, 473,
 474.
plendida, *Apis*, 521.
 Dinas, 388.
 Xylocopa, 521.
splendidus, *Imantodes*, 386, 387, 388.
 Imantodes *splendidus*, 388, 389, 391.
 pringeri, *Diplobothrium*, 25, 26
 (fig.), 28.
 purrelli, *Barbus*, 318, 326.
squamosus, *Phloeosinus*, 405, 448, 473,
 474.
Squilla, 53.
 ambigua, 56.
 incerta, 56.
 oculino, 53, 55 (fig.).
 swetti, 54.
Squillidae, 53.
Staphylinid beetles of the groups *Lis-*
pini and *Osorlinae*, Notes on the clas-
 sification, 75.
Staphylinidae 75, 76.
staudingeri, *Trigona*, 544.
Steganomus, 543, 601.
 javanus, 601.
Stegomastodon, 482.
 aftoniae, 512.
 arizorae, 481, 512.
 texanus, 482, 512.
steindachneri, *Barilius*, 320.
 Diploglossus, 370.
stejnegeri, *Sceloporus*, 350, 356.
Stelidium, 601.
Stelidium *trypetinum*, 601.
Stelidomorpha, 601.
Stelis, 535, 555, 579, 586, 592, 601, 605.
 abnormis, 579.
 aterrima, 555.
 (*Odontostelis*) *bivittatum*, 579.
 freygessneri, 592.
 lateralis, 574.
 montana, 586.
 rubi, 569.
Stellenigris, 601.
 vandeveldeii, 601.
steloides, *Anthidium*, 578.
 Megachile, 591.
Stenocolletes, 601.
 pictus, 601.
Stenosmia, 601.
Stenotritus, 542, 554, 571, 601.
 elegans, 601.
 (*Ctenocolletes*) *nicholsoni*, 542.
Sterculaceae, 178.
sternbergi, *Polyglyphanodon* 230, 234
 (fig.), 235 (fig.), 237 (fig.), 239 (fig.),
 241 (fig.), 242 (fig.), 243 (fig.), 245
 (fig.), 247 (fig.), 248 (fig.), 249 (fig.),
 252 (fig.), 253 (fig.), 254 (fig.), 255
 (fig.), 257 (fig.), 258 (fig.), 259 (fig.),
 260 (fig.), 262 (fig.).
stevensi, *Tanupolama*, 516.
sthena, *Augochloropsis*, 593.
Sthenelais, 107.
 articulata, 102, 107.
 grubel, 102, 106.
 hancocki, 107, 108.
 tertiaglabra 102, 107, 108.
Stictonomia, 601.
 punctata, 601.
stigmatica, *Trypanea*, 2, 5, 6 (fig.), 8,
 13, 15.
 Urellia, 8.
Stilbogastrus, 88.
Stilpnosoma, 601.
 laevigatum, 601.
stocki, *Simonycteris*, 476, 480, 497.
Stomatopod crustacean from the west
 coast of Mexico, new, 53.
Stomatopoda, 53.
Strandiella, 602.
 longula, 602.
stratissima, *Leptognathus*, 385.

- strenuus*, *Energoponus*, 547.
Streptocephalus, 34, 37, 39.
 dorotheae, 34, 35 (fig.), 38.
 seali, 33, 36, 37, 38.
 similis, 38.
 texasus, 33, 34, 35 (fig.), 36, 37, 38.
striatulus, *Heriadopsis*, 557.
strigatum, *Anthidium*, 536.
 Trachusa, 536.
strigosus, *Eumalus*, 88.
striola, *Lispinus* (*Lispinus*), 90.
strobi, *Pinus*, 472, 474.
stygius, *Sphecodes*, 566.
subaxillaris, *Heterotheca*, 20.
subgnita, *Augochlora* (*Augochloropsis*), 529.
subopacus, *Lispinus*, 89.
subopacus, *Pityophthorus*, 210.
subopacus, *Pseudolispinodes* (*Pseudolispinodes*), 89.
Subterraneobombus, 602.
 pamirus, 579.
subterraneus, *Apis*, 602.
 Bremus, 602.
subtilis, *Carea*, 41, 43.
succincta, *Apis*, 540, 552.
 Nomada, 577.
succini, *Meliponorytes*, 570.
Sudila, 536, 602.
 bidentata, 536, 602.
sugillatus, *Sceloporus jarrovi*, 357, 359, 360.
Sulcobombus, 540, 602.
sulfurea, *Parasabella*, 133.
superba, *Megacillissa*, 567.
 Nomada, 558.
 Plusia, 588.
suturalis, *Anoxia matutinalis*, 174.
 Cnemarachis, 167, 170, 171, 174.
Svastra, 602.
 bombilans, 602.
swaini, *Phloeosinus*, 402, 418, 421, 473.
swammerdamella, *Melitta*, 544.
Swammerdamia pyrella, 276.
swetti, *Squilla*, 54.
sylvorum, *Apis*, 604.
sylvatica, *Gaigeia*, 350.
Sylvilagus, 483, 492, 493.
 auduboni cedrophilus, 492.
 benzonensis, 475, 481, 492 (fig.).
 floridanus, 481, 511.
 floridanus, *holzneri*, 492.
 sp., 481.
Symmorpha, 570, 602.
Synapis, 602.
Synaspidia, 49.
 pretiosa, 49.
Synepeolus, 602.
Synhalonia, 602.
 edwardsii, 551.
Systropha, 602.
 (*Systrophidia*) *ogilviei*, 602.
Systrophidia, 602.
tabogae, *Neodryocoetes*, 181, 184.
tachiniformis, *Holosus*, 84, 88.
 Holosus (*Holosus*), 85, 90.
tachyporiformis, *Holosus*, 88.
 Holosus (*Neolosus*), 84, 85, 88, 90.
taclobanensis, *Halictus*, 559.
tacubayae, *Phloeosinus*, 398, 407, 466, 473.
taenia, *Nannochorax*, 314.
Taenlandrena, 602.
taeniatulus, *Gerrhonotus*, 364, 368.
taeniocnemis, *Sceloporus malachiticus*, 350.
tajasica, *Gobius* (*Chonophorus*), 347.
tandilensis, *Melissoptila*, 571.
Tanguticobombus, 603.
tanguticus, *Bombus*, 603.
Tanupolama, 497, 514, 515, 516.
 americana, 516.
 longurio, 475, 481, 514, 515, 516 (fig.).
 mirifica, 516.
 stevensi, 516.
Tapinotapsis, 608.
Tapinotaspis, 603.
 chacabucensis, 603.
tardus, *Lispinus* (*Lispinus*), 90.
Tarsalia, 603.
 hirtipes, 603.
tarsata, *Tetralonia*, 556.
taurea, *Anthophora*, 547.
taylori, *Balomys*, 488, 489, 508, 509.
taxodii, *Phloeosinus*, 405, 450, 473, 474.
Taxodium, 397.
 distichum, 405, 451, 452, 473, 474.
tegularis, *Afrostellis*, 522.
tehuanae, *Lepidophyma smithii*, 377, 379, 380.
tejonensis, *Ceratina*, 608.
Teleutemnesta, 603.
 fructifera, 603.
Temnosoma, 603.
 metallicum, 603.
tenellus, *Lispinus*, 89.
 Pseudolispinodes (*Pseudolispinodes*), 89.
Tentacularia lepida, 31.
tenuicornis, *Arla*, 269.
tenuis, *Cirratus*, 101, 126, 127, 128.
 Lumbriconereis, 102, 124.
tenuis, *Neodryocoetes*, 181, 197.
tenuisetis, *Lumbrineris ehlersi*, 117.
tenuissimus, *Himantodes*, 390.
 Imantodes, 390, 391.
teocote, *Pinus*, 214, 215, 219.
teres, *Neodryocoetes*, 181, 190.
 Neopityophthorus, 181.
terminalis, *Anthophora*, 589.
terminata, *Tetralonia*, 604.
Terrestribombus, 531, 532, 564, 603.
terrestris, *Apis*, 531, 532, 564, 603.
 Bombus, 564.
 Bremus, 603.
tertiaglabra, *Sthenelais*, 102, 107, 108.
tertius, *Pityoborus*, 177, 202.
tessellatus, *Gerrhonotus liocephalus*, 365.
testacea, *Melipona*, 585, 586.

- testaceicornis*, *Melipona*, 575.
Testudo sp., 479.
Tetrachlora, 603.
Tetragona, 603.
Tetralonia, 551, 566, 571, 602, 608.
 analis, 566.
 basizona, 603.
 mirabilis, 605.
 tarsata, 556.
 terminata, 604.
Tetraloniella, 603.
 graga, 603.
 graja, 603.
Tetrapaedia, 604.
Tetrapedia, 548, 598, 604.
 diversipes, 604.
 goeldiana, 562, 598.
 muelleri, 537, 545.
Tetraperdita, 604.
 sexmaculata, 604.
Tetrapedium, 604.
Tetrapleurus, 88.
 indicus, 88.
Tetrarhynchus, *palliatu*s, 31.
texana, *Nomada*, 535.
 Parasphecodes, 600.
 Sphecodes, 600.
texana, *Trypanea*, 4, 5, 6 (fig.), 13.
texanum, *Glyptotherium*, 490.
teuanus, *Phloeosinus*, 406, 462, 473.
texanus, *Stegomastodon*, 482, 512.
 Streptocephalus, 33, 34, 35 (fig.), 36, 37, 38.
texensis, *Geomys*, 487, 508.
Texoceros sp., 481, 497.
Thalestria, 604.
 smaragdina, 604.
Thamnophthorus, 177, 178.
 linearis, 178.
 nudus, 178.
 schwarzi, 178.
 volastos, 178.
Thaumatosoma, 604.
 duboulai, 604.
Theobroma cacao, 184.
thomasi, *Austrodioxys*, 530.
Thomomys, 487, 507, 508.
thoracica, *Andrena*, 555.
 Apis, 555.
 Biglossa, 530.
 Melecta, 531.
thoracicus, *Athyreodon*, 288.
Thoracobombus, 604.
Thoracochirus, 79.
Thoracophori, 76, 77, 78, 79.
Thoracophorini, 75.
Thoracophorus, 88.
 elcaticosus, 88.
 corticinus, 88.
 excisicollis, 88.
 (*Leipophorus*) *minutissimus*, 88.
 nitidus, 88.
 (*Stilbogastrus*) *nitidus*, 88.
Thrausmus, 604.
 grandidieri, 604.
Thrinchostoma, 548, 576, 604, 605, 606.
 renitantly, 604.
 (*Nesothrinchostoma*) *serricorne*, 576.
 torridum, 548.
Thuja, 397.
 occidentalis, 453, 464, 465, 472, 474.
 plicata, 426, 431, 433, 435, 437, 450, 472, 473, 474.
thujae, *Hylesinus*, 400.
Thyce fieldi, 164.
Thygater, 604.
Thygatina, 604.
 fumida, 604.
Thymaridina, 288.
Thynnus abdominalis, 546, 549.
thyoides, *Chamaecyparis*, 453, 465, 472, 473.
Thyreothremma, 604.
 rhopalocera, 604.
Thyreotremata, 604.
Thyreus, 541, 604.
thysanoecephalum, *Thysanoecephalum*, 25, 26, 28.
Thysanoecephalum, 25.
 crispus, 31.
 rugosum, 25, 26 (fig.).
 thysanoecephalum, 25, 26, 28.
tibetanus, *Apathus*, 547.
tibialis, *Andrena*, 588.
 Eleusis, 88.
 Melitta, 588.
Tilapia, 342, 344.
 büttikoferi, 340, 342, 344.
 galilaea, 344.
 malanopleura, 340, 342, 344.
 pleuromelas, 340, 342, 344.
 savagel, 341, 342, 345.
 sparrmanni, 344.
 zillii, 340, 342, 344.
timberlakei, *Ashmeadiella*, 528.
Triopasites, 606.
Xeralictus, 607.
Tinea pyrella, 276.
tintinnans, *Eclectica*, 547.
Tiphia brevicornis, 530, 585, 596.
titanis, *Ancylonycha*, 173, 175.
Titusella, 604.
 pronitens, 604.
titusi, *Ceratina* (*Crewella*), 541.
Toba, 605.
tomentosus, *Halictus*, 574.
 Hylaeus, 574.
Torrida, 279.
torrida, *Mesotrichia*, 573.
torridum, *Halictus*, 548.
 Thrinchostoma, 548.
torridus, *Onychomys*, 490.
Tostegoptera, subg., 161, 162.
Tostegoptera cribrosa, 162.
Townsendiella, 605.
 pulchra, 605.
Trachandrena, 605.
Trachina, 605.
Trachusa, 535, 546, 555, 601, 605.
 atra, 582.
 cincta, 546.

- Trachusa serratulæ*, 605.
strigatum, 536.
tranquebarica, *Bombus*, 579.
Xylcopa (*Nyctomelitta*), 579.
transversa, *Haplidia*, 163.
Trematodes, 157.
triangulifera, *Nomia*, 549.
tricarinatus, *Heriades*, 578.
Megachile, 578.
Trichanthidium, 605.
Trichestes, 162.
Trichesthes, 162.
trichiothalmus, *Caenohalicetus*, 532.
Trichiothecus, 284, 285.
ruficeps, 285.
Trichocerapis, 605.
Trichocolletes, 605.
Trichomalus trujilloi, 45, 46.
trichomycteroides, *Paramphilius*, 333, 334.
Trichostoma, 604, 605.
Trichota, 560, 586, 605, 606.
triclincta, *Cilissa*, 538.
Melitta, 538, 561, 571.
tricingulum, *Lasioglossum*, 562.
Tricornibombus, 606.
tricornis, *Agrobombus* (*Tricornibombus*), 606.
Bombus, 606.
Osmia, 580.
tridentata, *Osmia*, 606.
Tridentosmia, 606.
Triepeolus, 602, 606.
(Synepeolus) insolitus, 602.
minimus, 528.
trifasciatum, *Camptopoeum*, 521.
Triga, 79.
Trigona, 524, 558, 560, 563, 564, 581, 585, 586, 598, 606.
amalthæa, 45.
(Tetragona) elongata, 603.
gribodol, 560.
itama, 558.
latitarsis, 598.
limao, 564.
mediorufa, 581.
mosquito, 588.
nitidiventris, 563.
orbigny, 606.
(Paratrigona) prosopiformis, 585.
silvestril, 553.
staudingeri, 544.
Trilla, 606.
trilineata, *Eteone*, 101, 111 (fig.), 113.
Trilophosaurus, 243.
trimmerana, *Andrena*, 559.
Melitta, 559.
Trinchostoma, 604, 606.
triodonta, *Osmia* (*Atoposmia*), 529.
Triodonyx, 157, 158, 160.
Triopasites, 606.
timberlakei, 606.
trispilus, *Barbus*, 318, 324.
Puntius (*Barbodes*), 324.
tristis, *Diploaxis*, 163.
Melolontha, 162.
Tropandrena, 606.
Trophocleptia, 606.
variolosa, 606.
tropicalis, *Neojapyx*, 298.
truei, *Peromyscus truei*, 489.
trujilloi, *Trichomalus*, 45, 46.
truncata, *Nomada*, 572.
truncatum, *Anthidium*, 573.
Pachyanthidium (*Micranthidium*), 573.
truncorum, *Anthophora*, 557.
truncorum, *Apis*, 557, 607.
Heriades, 607.
Trupanea agerata, 8.
eclipta, 9.
mevarna, 14.
Trypanea, 1, 2.
actinobola, 4, 6 (fig.), 13, 15, 16, 17.
agerata, 3, 6 (fig.), 8.
alba, 9.
arizonensis, 5, 6 (fig.), 15.
bisetosa, 4, 5, 6 (fig.), 12.
californica, 4, 6, 17.
conjuncta, 4, 6 (fig.), 12.
dacotera, 4, 5, 6 (fig.), 14, 15.
eclipta, 3, 6 (fig.), 8, 9.
erasa, 5, 6 (fig.), 16.
eugenia, 2, 5, 6 (fig.), 8, 13.
femoralis, 3, 6 (fig.), 10, 17.
hebes, 11.
imperfecta, 3, 5, 6 (fig.), 10.
jonesi, 6 (fig.), 15, 17.
metoica, 9.
mevarna, 4, 6 (fig.), 14.
microsetulosa, 4, 6, 17.
microstigma, 3, 6 (fig.), 11.
nigricornis, 3, 5, 6 (fig.), 10, 12.
occidentalis, 13, 17.
peruviana, 3, 6 (fig.), 8.
polyclona, 13.
radifera, 3, 6 (fig.), 11.
stigmatica, 2, 5, 6 (fig.), 8, 13, 15.
tewana, 4, 5, 6 (fig.), 13.
vicina, 6 (fig.), 13.
wheeleri, 6, 17.
Trypeta, 18.
actinobola, 16.
femoralis, 10.
(Urellia) mevarna, 14.
solaris, 14.
Trypetes, 557, 607.
productus, 576.
trypetinum, *Stelidium*, 601.
tuberculatus, *Luperodes*, 58, 62.
tudes, *Platysqualus*, 30.
tultus, *Citellus*, 506.
Tumidicoxoides, 41.
jambolana, 41.
sp., 41.
turnerae, *Calliopsis*, 592.
Turnerella, 607.
gilberti, 607.
12-guttata, *Allotheronia*, 288.
Typhlosynbranchus boueti, 303.
umbraculata, *Centris*, 548.
unifasciatus, *Neolebias*, 312, 315.

- Upper Cretaceous lizard from Utah, osteology of *Polyglyphanodon*, 229.
- Urellia* bisetosa, 12.
 conjuncta, 12.
 eugenia, 8.
 imperfecta, 10.
 nigricornis, 10.
 occidentalis, 17.
 radifera, 11.
 stigmatica, 8.
 vicina, 13.
- Urocentrum*, 252.
- Uromastrix*, 252.
- ursina*, *Apis*, 582.
- ursinus*, *Ancylosceles*, 525.
- ussheri*, *Gnathonemus*, 308, 310.
- ussuriana*, *Ctenoplectra*, 588.
- Uta* bicarinata *anonymorpha*, 361.
 bicarinata bicarinata, 361.
- utahensis*, *Juniperus*, 407, 413, 462, 470, 472, 474.
Phloeosinus, 406, 458, 473, 474.
- vallorum*, *Podalirius*, 527.
- vandeveldii*, *Stellenigris*, 601.
- vandinel*, *Cnemarachis*, 167, 169, 170, 174.
Lachnosterna, 159.
- vandykei*, *Luperodes*, 59, 73.
- vandykel*, *Phloeosinus*, 403, 425, 473, 474.
- variabilis*, *Nomia* (*Reepenia*), 595.
- varicornis*, *Luperodes*, 57, 59, 65, 67, 69, 70, 71, 74.
Luperus, 65.
- variegata*, *Alloclape*, 523.
Andrena, 550.
Apis, 548.
Epimethea, 548.
Mellinus, 575.
Nomada, 548.
Nomioides, 550.
Prosopis, 575.
- variolatus*, *Phloeosinus*, 399, 404, 437, 438, 473.
- variolosa*, *Heriades* (*Neotrypates*), 576.
Megachile, 576.
Polyphylla, 175.
Trophocleptria, 606.
- vasconcelosi*, *Gerrhonotus*, 364.
- velutina*, *Hopliphora*, 580.
Mesochelra, 559, 580.
- ventralis*, *Gerrhonotus* *hiocephalus*, 365.
Scincus, 370.
- venustus*, *Lamprocolletes*, 605.
- verbenae*, *Calliopsis*, 607.
- Verbenapis*, 607.
- vernalis*, *Oediscelis*, 579.
- vernoniae*, *Ctenocorynura*, 542.
Neaspiota, 18.
- veronis*, *Felis*, 506.
- versatilis*, *Mimulapis*, 574.
- versicolor*, *Apis*, 543.
Centris, 543.
- Vespa* concinna, 560.
 pratensis, 538.
- vestita*, *Andrena*, 588.
- viator*, *Melissina*, 570.
 vicina, *Trypanea*, 6 (fig.), 13.
Urellia, 13.
- victoriae*, *Gastropsis*, 571.
Melitribus, 571.
- vidua*, *Megachile*, 544.
- viduus*, *Conophis* *vittatus*, 395.
- Viereckella*, 607.
 obscura, 607.
- vigilans*, *Phileremulus*, 587.
- villosa*, *Anoxia*, 164.
Apis, 528, 565.
Megachile, 528, 565.
Osmia, 565.
- villosella*, *Apogonia*, 163, 172, 173.
- violacea*, *Apis*, 608.
Xylocopa, 608.
- violaceipennis*, *Melanapis*, 569.
- violae*, *Andrena*, 561.
- viperinus*, *Epeolus*, 533, 582.
- virescens*, *Melolontha*, 173.
- virginiana*, *Juniperus*, 453, 465, 472, 474.
Pinus, 46.
- virginis*, *Nephtys*, 113.
- viride*, *Cnemidium*, 539.
- viridiceps*, *Ctenoplectrella*, 542.
- viridiflavus*, *Gerrhonotus*, 364, 369.
- viridis*, *Eulalia*, 101, 111 (fig.), 112.
Nereis, 112.
- virilis*, *Pityophthorus*, 223.
- vittata*, *Eleotris*, 347.
- vittatus*, *Conophis* *vittatus*, 395.
- vivida*, *Eumidia*, 101, 112.
- volastos*, *Thamnophthorus*, 178.
- Volucellobombus*, 607.
volucelloides, 607.
- volucelloides*, *Bombus*, 607.
Volucellobombus, 607.
- vorax*, *Pellonula*, 304.
- vulgaris*, *Dufourea*, 547.
- Washington State, notes and new species of Microlepidoptera from, 267.
- washingtoniana*, *Sequola*, 432, 473, 474.
- webbii*, *Gerrhonotus*, 365.
- websteri*, *Aroga*, 273.
- Wedel, W. R., and Hill, A. T., on scored bone artifacts of the central Great Plains, 91.
- wellmanni*, *Gronoceras*, 555.
- West Indian melolonthine beetles, descriptions of the larvae and a key to the known larvae of the tribe, 167.
- wheeleri*, *Trypanea*, 6 (fig.), 17.
- whitmanella*, *Chionodes*, 271.
- wiegmanni*, *Gerrhonotus*, 365.
- williamsi*, *Gnathylaeus*, 555.
- wilmattae*, *Xeromelissa*, 608.
- Xanthidium*, 557, 607.
- xanthogaster*, *Rhopalomelissa*, 596.
- xanthopoda*, *Prosopis*, 554.
- xanthopus*, *Melitta*, 562.
- Xanthosarus*, 607.
- Xanthosmia*, 607.
- Xenoglossa*, 586, 607.

- Xenoglossa fulva*, 607.
ipomoeae, 534.
Xenoglossodes, 607.
xenomastax, *Ashmeadiella* (Cublitog-
natha), 543.
Xenomystus, 806.
nigri, 306.
Xeralictus, 607.
timberlakei, 607.
Xeromegachile, 607.
Xeromelecta, 608.
Xeromelissa, 608.
Xeromelissa wilmattae, 608.
Xerophasma, 608.
bequaerti, 608.
Xilocopa, 608.
Xoridescopus, 279.
Xylocopa, 523, 529, 530, 531, 542, 577, 579,
580, 588, 592, 598, 608.
appendiculata, 523.
bomboides, 531.
coerulea, 543.
collaris, 608.
confusa, 551, 580.
latipes, 529, 588.
(*Schönnherria*) *micans*, 598.
muraria, 537, 567.
nasalis, 530.
olivieri, 592.
splendida, 521.
(*Nyctomelitta*) *tranquebárica*, 579.
violacea, 608.
xylocopoides, *Megachile*, 569.
Zacesta, 608.
rufipes, 608.
Zacosmia, 573, 608.
Zadontomerus, 608.
Zalygus, 608.
cornutus, 608.
Zadontomerus, 608.
Zaperdita, 608.
zapoteka, *Megachile*, 541.
Zarhopalus, 47.
zebrata, *Perdita*, 576.
Zelleria parnassiae, 276.
pyri, 275.
zeteki, *Pityophthorus*, 226.
zibethica, *Ondatra*, 511.
zilli, *Acerina*, 344.
Tilapia, 340, 342, 344.
zonalis, *Perdita*, 577.
Zonandrena, 608.
zonata, *Arabella*, 102, 125.
Lumbriconereis, 102, 123.
Lumbrineris, 102, 123 (fig.)
Notocirrus, 102, 125.
Zonocryptus 277.
sphinxis, 278.
Zonohirsuta, 608.
Zonopimpla, 283.
albicincta, 283, 284.
ashmeadi, 283.
zunilensis, *Chirodines*, 162.
zygaena, *Sphyrna*, 81.
Zygogeomys, 508.

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